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THE IRON AGE

THE NATIONAL METALWORKING WEEKLY November 30, 1950

VALLEY MOULD & IRON CORP.

General Offices: HUBBARD, OHIO

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6,154,648 tons of steel rolled on this bearing lubricated by Farval

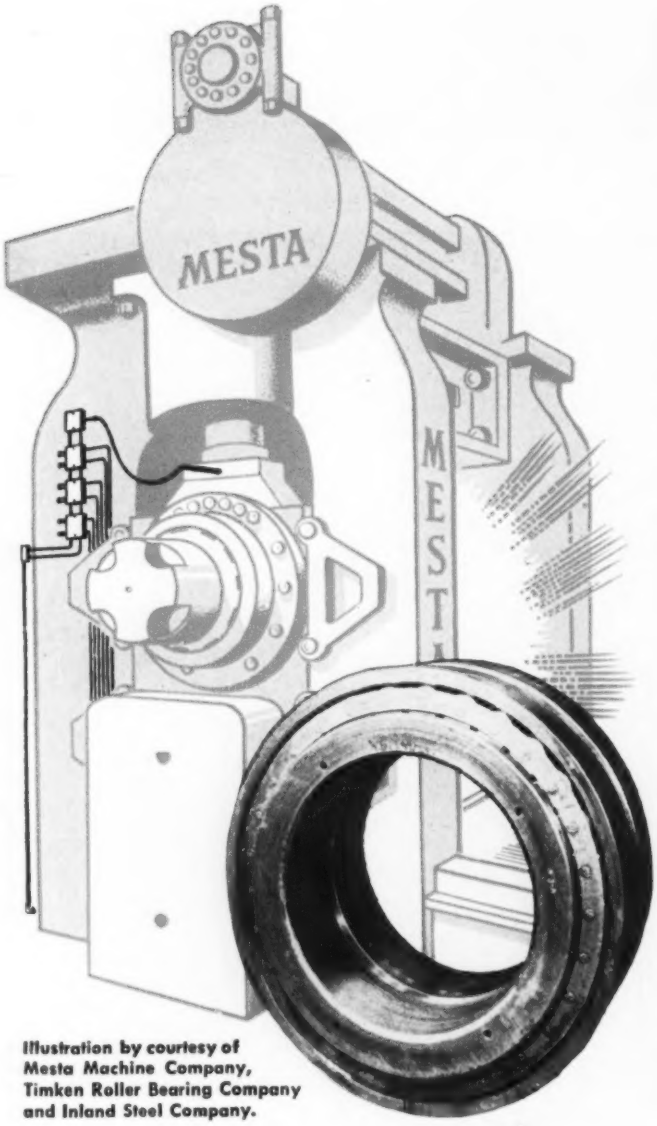

Illustration by courtesy of Mesta Machine Company, Timken Roller Bearing Company and Inland Steel Company.

EIGHTEEN years ago, this continuous hot strip mill was installed at the Inland Steel Company, Indiana Harbor Works, East Chicago, Indiana. It was then the last word in rolling mills, with roll necks equipped with Timken bearings and lubricated with three Farval Heavy Duty Automatic Lubrication Systems.

Since then this mill has rolled more than six million tons of steel. The Timken roll-neck bearing shown in this illustration, when removed for photographing, had a total of exactly 6,154,648 tons to its credit. Inspection at that time showed that the bearing was still in splendid condition, good for many thousand tons more. There has never been a bearing failure or an interruption of production because of inadequate lubrication—thanks to Farval.

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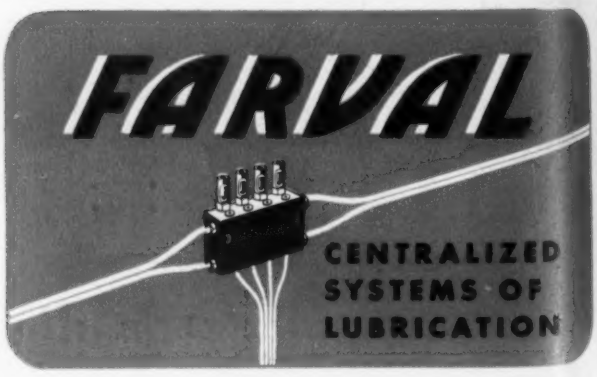
FARVAL—*Studies in Centralized Lubrication*
No. 116



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THE IRON AGE

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November 30, 1950 • • • Vol. 166, No. 22

Special Article

Sigma phase has been a thoroughly confused subject. Part I of this two-part article clarifies many of the misunderstandings, though there are many mysteries not yet understood.—p. 63.

Issue Highlights

Wet tumbling at Bendix Aviation's South Bend plant is cheaper than hand burring, and uniformity is higher. Zinc, aluminum, magnesium and steel parts from 1 oz to 15 lb are handled.—p. 69.

Notch test properties respond sensitively to chemical and structural differences in high-strength steels. Notch test catches differences in heat treatment which hardness, tensile and elongation tests do not detect.—p. 76.

The break in the steel wage-price picture was due to be announced on Wednesday or Thursday of this week. U. S. Steel Corp intends to absorb a substantial part of wage and accumulated materials cost increases and will raise prices about $6 a ton. The wage settlement will be about 12¢ an hr on base, for a 15½¢ to 16¢ average increase, or about 18¢ an hr with fringe concessions.—p. 85.

China's clamp-down on shipments of vital tungsten to the U. S. is a threat to our defense effort. Overcoming this handicap from domestic sources may test our ingenuity to the core.—p. 85.

Washington would like to see titanium production soar and is offering "lures" to promote it in industry. Industry on the other hand knows that the metal has practically no commercial applications and for the time being limited military uses.—p. 87.

First direct government loans to business for defense production purposes are due to be granted within the next few weeks. Application forms are now available at field offices of certifying agencies.—p. 89.

Producers of galvanized steel products are feeling a heightened zinc shortage and are cutting back production. Inventories are shrinking even more. Manufacturers blame a greatly grown stockpile hunger for zinc.—p. 95.

Coming Next Week

Super high-speed steels are expensive, but they have greater wear resistance and 20 to 30 pct higher hot hardness than standard high-speed tool steels. And they're tougher than cast alloys or carbides. Feeds twice those with standard high-speed steel tools can be used.

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ready for service in the hot spot

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Throughout the years, striped red wabbler rolls were used by leading producers under the hottest and hardest rolling-mill conditions. Then, in 1934, Mack-Hemp installed the first reversing hot strip mill with coil heating furnace. This pioneering experience with rolls for hot strip production resulted in the development of NIRONITE grain-type chilled rolls of special nickel alloy.

NIRONITE rolls are used in the 66-inch single stand reversing hot strip-sheet mill at Crucible Steel Company of America, Midland, Pennsylvania. The illustration shows a striped red wabbler work roll, 27" in diameter, being installed "ready for service in the hot spot" where a rolling speed of 1200 feet per minute is attained with strip temperatures up to 2100° F.

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Editorial

INDUSTRY VIEWPOINTS

Who's Fooling Who?

THE star chamber clambake on the excess profits tax should scare the daylights out of us. The question isn't how much should we raise by taxes. It isn't even how we shall do it.

The catch is—how far we are going in this country to fool the people with fancy words? We have gone quite a way. We have welfare, gracious living, babies cry for television, freedom for labor, freedom for business, planned economy, security and other words that leave a nice cozy feeling—so we think.

A lot of these high-sounding sugar pills cover some pretty bitter stuff. They taste good going down but sooner or later their deadening effects will strike home.

Business has not tried to dodge its responsibility on defense taxes. Industrial groups have used a lot of gray matter drawing up fair, logical and anti-inflationary plans for taxes.

Does this mean anything to the Administration or its yes-men? Of course it doesn't. They want a tax that will bring in just what business wants—but with a big difference.

The Administration is holding out for a defense tax with an excess profits label. That would give the people the idea that profits will be excessive. It suggests that business does not want to foot its share of the bill.

The excess profits tax submitted by the Administration is evil in itself. It limits initiative; it is sugar coated but bitter in its probable effects. It is even loosely drawn and runs counter to its intended purpose—to fight inflation and prevent windfall profits.

Plans submitted by business and other organizations look at the problem sanely. They will raise just as much revenue. No one will get rich out of the defense program. But that is beside the point.

Debate has been limited. People have been insulted. Democratic ideals are being flouted. That is serious. It is as serious as defense itself. If we deny our people free expression—one of the things we hope to defend—we are as bad as the Russians.

Who is fooling who(m)? Let's find that out—and soon.

Tom C. Campbell

Editor

Select NIAGARA

NIAGARA RING AND CIRCLE SHEAR

- ★ Circular blanks of various diameters and thicknesses are quickly and accurately cut.
- ★ Initial cost and maintenance of blanking dies is eliminated.
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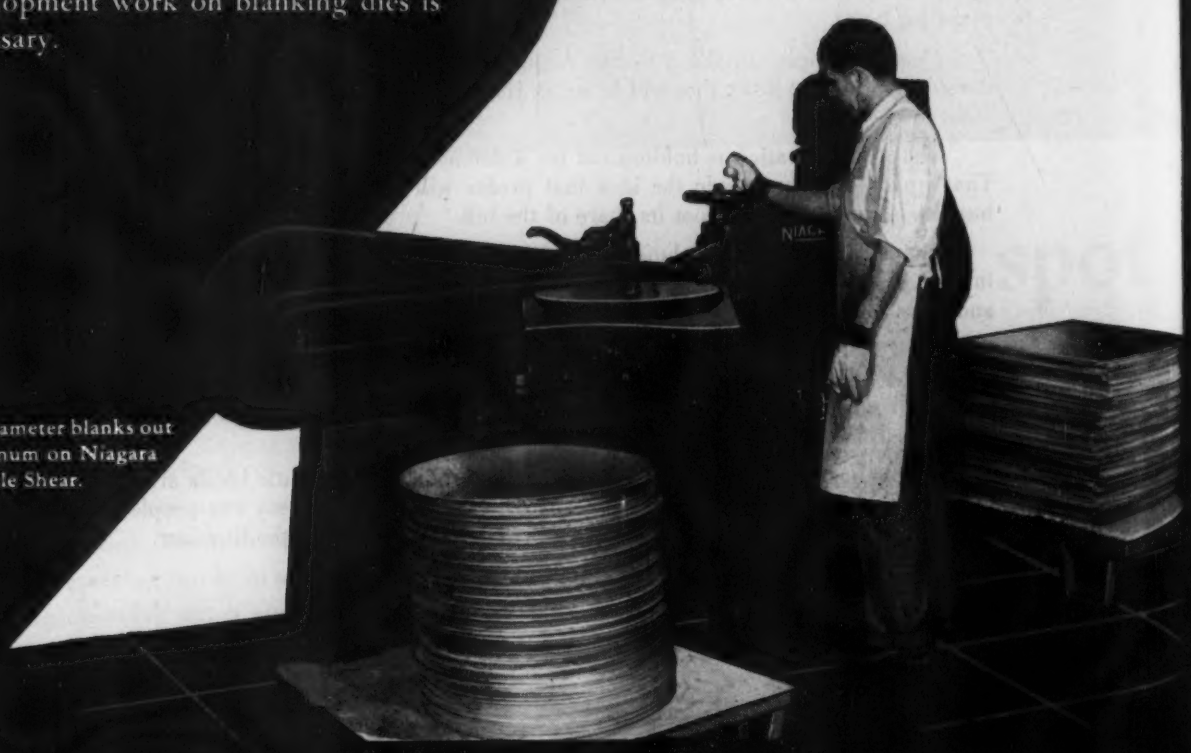
For instance, in the Buffalo Plant of American Machine & Foundry Company a NIAGARA Ring and Circle Shear is teamed up in economical production with a NIAGARA Double Crank Press making aluminum restaurant equipment.



Cutting 22" diameter blanks out of 1/8" aluminum on Niagara Ring and Circle Shear.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

NEWSFRONT

NEWS, METHODS AND PRODUCT FORECAST

► Some industrialists now believe that a separate arms industry may grow up in this country similar to the Krupp and Skoda arms plants in Europe. These men say that, as an example, an auto plant trying to run half on arms and half on autos is neither a good arms plant nor an efficient auto plant.

► Companies which a few weeks ago regarded priorities as a necessary evil to be ignored (except when they appeared on purchase orders) have changed their tune. They are now asking their salesmen to obtain every possible priority to help them get scarce materials. Which is a perfect example of how the priority system feeds on itself and will eventually die of an overdose of its own medicine.

► Watch for an early increase in the limits on DO orders which steel mills must accept. Reasons: Some mills are now booked to the limit; some are already over.

► The Munitions Board is asking industry whether forging hammers of larger size than have been built in the past would conserve manpower and materials and increase production of military goods. This inquiry is part of a current survey of large forging hammer capacity.

► Commercially pure titanium has been proved to be 1400 times more wear resistant than regular copper-nickel water tubes in marine applications. The erosion and corrosion tests were made by the Navy. They were conducted in sea water at a water flow rate of 27 ft per sec.

► A new gasoline and oil resistant wire insulated with a vinyl compound and sheathed in a highly resistant jacket has been developed for use at pilot plants and terminals where oil gets on wires. It may eliminate the lead covering previously used on this type of wire.

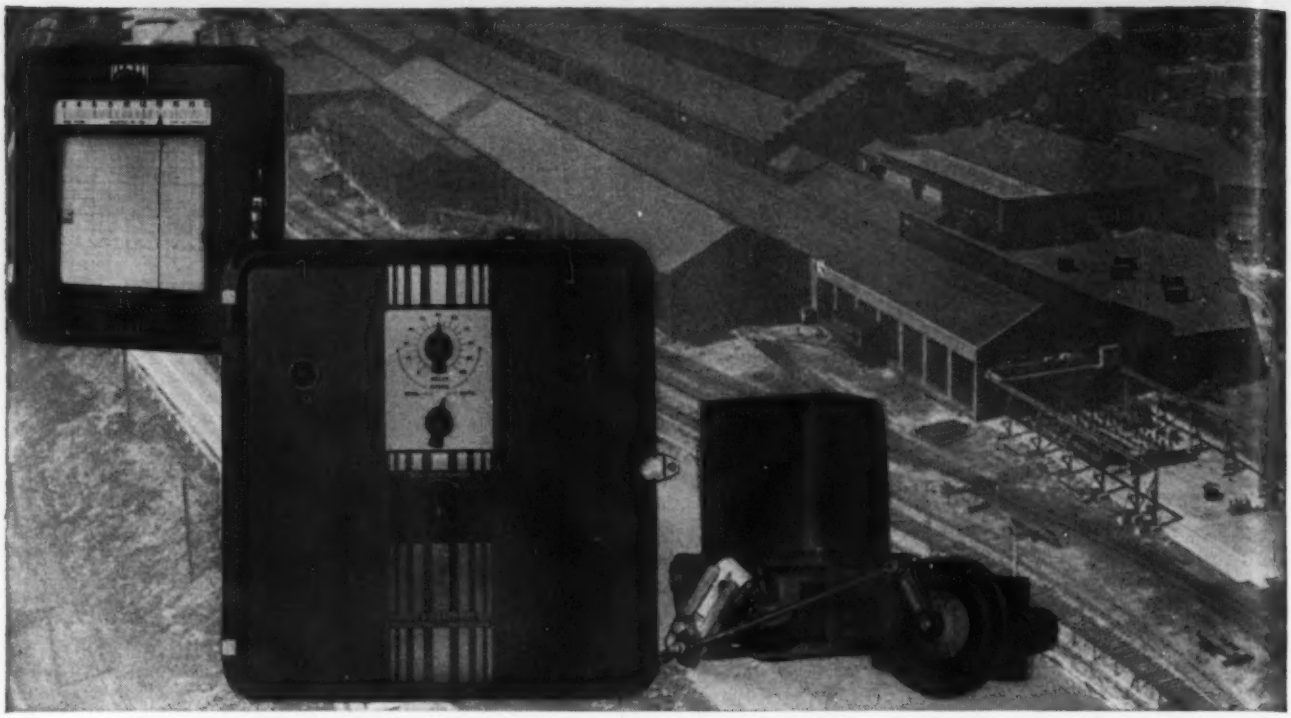
► A pilot plant for production tests of a new continuous casting process for steel has just started operating in Belgium. The machine casts 4 x 4-in. or 6 x 6-in. billets into water-cooled heat-resistant steel molds.

► Ford Motor Co. has developed a quality level certification plan in which the company sits down with its suppliers to work out mutually agreeable sampling plans to control quality. The plan permits correlation of inspection methods and assures that acceptance or rejection is based on common measurements and standards.

► At Ft. Belvoir, Va., Army Engineers are testing a whole line of earth-moving and other construction equipment having an 8-ton weight limit. Some are specially designed, others are standard commercial items.

► The automobile industry has been advised by the government that unless a substantial reduction in consumption of materials needed for defense and stockpile purposes is voluntarily effected, direct control of production schedules will be forthcoming.

► A lot of steel gray market brokers would be out of business were it not for foreign steel—domestic mills have cut domestic leaks to a trickle. What does move is at fearful prices; $400 a ton is "not too bad" for cold-rolled sheets, but some recently brought $620!



Major Advance in Electric Control Increases Production From Industrial Operations

With production demands reaching toward fresh all-time highs, this new P.A.T.'50 Control comes at the ideal time to help thousands of firms increase the output of their industrial furnaces. Here's why:

This Control has something that's brand new. It acts on the *speed* of swings in furnace load, as well as on their size and permanence. Thus, if temperature changes gently, it is gently nudged back into line. But if it starts off briskly—as when the furnace door is opened—P.A.T.'50 reacts briskly. The faster the change, the further P.A.T.'50 moves the fuel valve. Then, at the instant this action begins to head off the change, the Control starts backing away. By putting on the brakes it brings temperature back in line smoothly, rapidly.

This "Rate Action" increases production because it reduces the length of time a furnace is off temperature. It means more heats per week.

P.A.T.'50 is the Only electric positioning control with Rate Action. It's a unique L&N contribution to automatic regulation.

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When we gave P.A.T. its third component of rate action—and introduced it in this '50 model—we were able also to increase the sensitivity and range of adjustment of proportioning and reset components. The resulting improvement in control action shows up at all times, but especially when temperature is being stubborn—trying to edge away from the control point, or to level off incorrectly. Even without rate action, P.A.T.'50 would do a better-than-ever job. But with rate action, results are far superior to any previous electric control.

The News is in the Control Unit. Everything new in P.A.T.'50 is in the Control Unit—the device in center of above illustration which is usually mounted below the Speedomax or Micromax Recording Controller, and which links that instrument to the fuel-valve-driving mechanism. In line with our policy of making improvements readily available to users of our equipment, earlier installations of P.A.T. Control can be converted to P.A.T.'50 by replacing the Unit and making slight changes in the Controller. The new Unit is fully electronic—has no moving parts except two hermetically-sealed relays.

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Steel Gray Market Blossoms

Weird Deals; Fantastic Prices

King Winter Bites Into Output

The Iron Age SUMMARY

IRON AND STEEL INDUSTRY TRENDS

THIS week the fabulous gray market in steel is back in full bloom. It is being nurtured by insatiable demand born of desperation among steel consumers. As in the past, it is characterized by fabulous prices and weird deals. A dependable source of supply is the only thing preventing it from mushrooming to tremendous proportions.

Fortunately, steel producers have clamped such tight control on the sale of their output and where it is going that at least part of the would-be gray market is starving to death for lack of tonnage to feed on. The majority of today's gray market steel is coming from foreign sources.

More Inquiries than Sales

There are a great many more gray market inquiries than there are sales; many deals never come off. To begin with most of the tonnages are mythical. Investigation proves some of the quality bad. And some deals involve downright fraud. But despite the many pitfalls and the tragic experiences of others there are many desperate fabricators who will buy whatever tonnage is available—with little or no quibbling over price.

There seems no limit to what they will pay. An auto producer paid $700 a ton for terneplate. A Pittsburgh manufacturer, blacklisted for reselling in the gray market, paid $620 a ton for cold-rolled sheets. These are exceptions. Other high gray market prices per ton are as follows: Heavy plate, $240 to $250; hot-rolled sheets, $300 to $320; cold-rolled sheets, $400 to $420; galvanized sheets, $375 to $395. These are top prices, aimed at charging all the traffic will bear. They represent markups of $150 to $300 a ton.

Few manufacturers can afford to operate wholly on such high priced steel. Their costs just won't permit it. They buy only as a last resort to complete an order, to supplement their regular supply, to provide steel for vital parts, to keep suppliers operating, or to keep from shutting down plants.

Mill Policing Is Effective

Policing of their orders by domestic mills has been effective. They still have vivid memories of bitter experience with the gray market of 1948, and they are profiting by them. Early in the present upsurge of the steel market they adopted a tough policy toward gray market activity. Some questionable orders have been refused. And shipments to several customers have been cut off after it was found that steel sold to them turned up in the gray market.

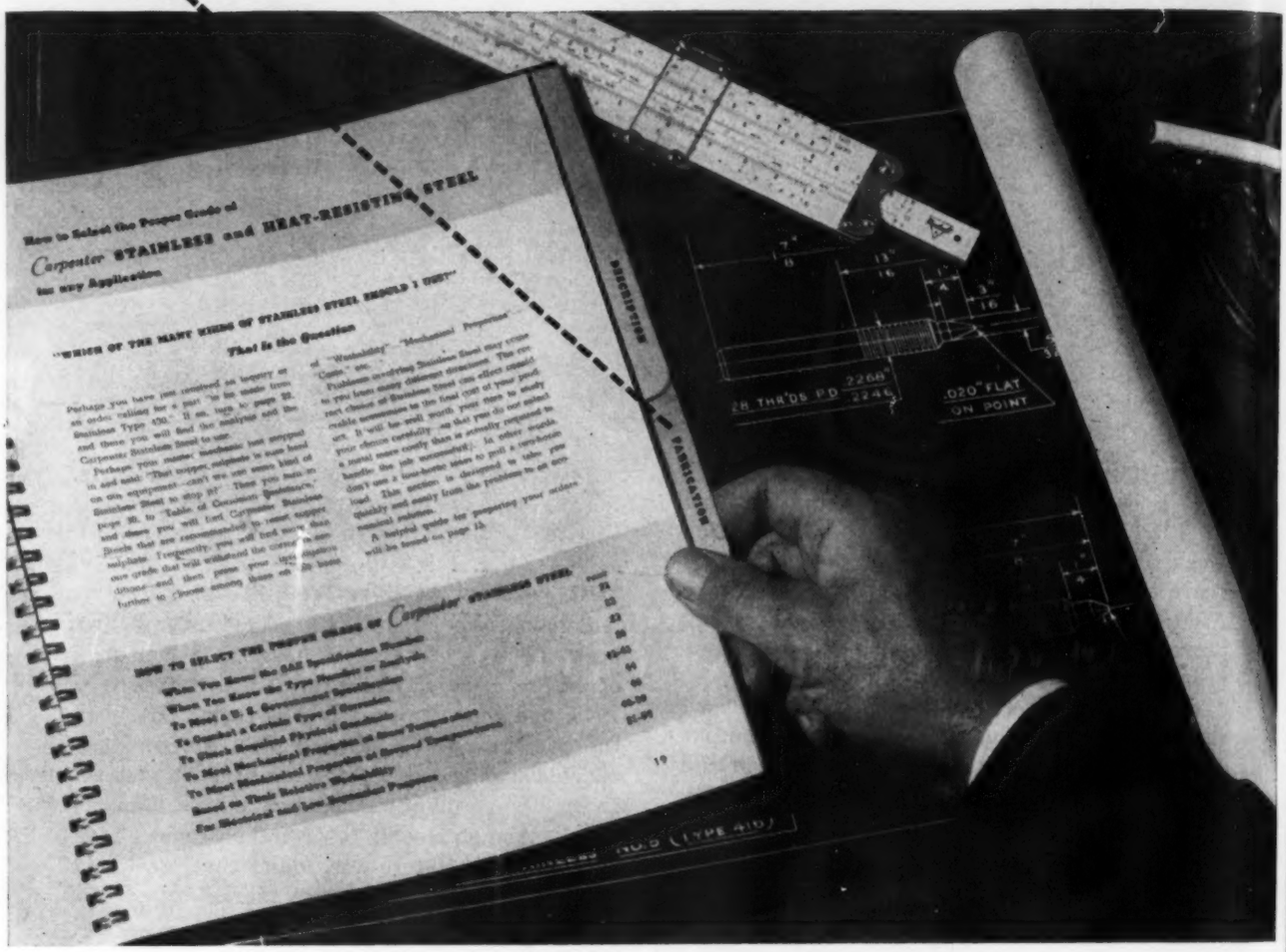
The policing of orders by mills is unrelenting. Several months ago a customer tipped off a mill that he had bought gray market steel bearing the mill's markings. The mill traced the sale to an export firm which admitted selling the steel at about $2000 profit. The purchaser had then sold it to the final consumer at a premium of $4500. When asked to make restitution the exporter just laughed. But the mill put on the pressure and the pay off came this month when the export firm, since reorganized, sent the mill a check for $4500. The mill then sent its own check for the same amount to the consumer, reimbursing him to the full extent of the premium paid.

King Winter Takes Toll

As if the steel people didn't already have enough trouble, this week king winter took a healthy bite out of steel production (see page 109). Hardest hit were the Pittsburgh and Cleveland districts where record snows virtually immobilized all transport, making it impossible to move raw materials over interplant rail lines. By midweek the mills were starting on their way back toward capacity output.

(See p. 85 for story on steel wages and prices)

X MARKS THE SPOT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That Is the Question
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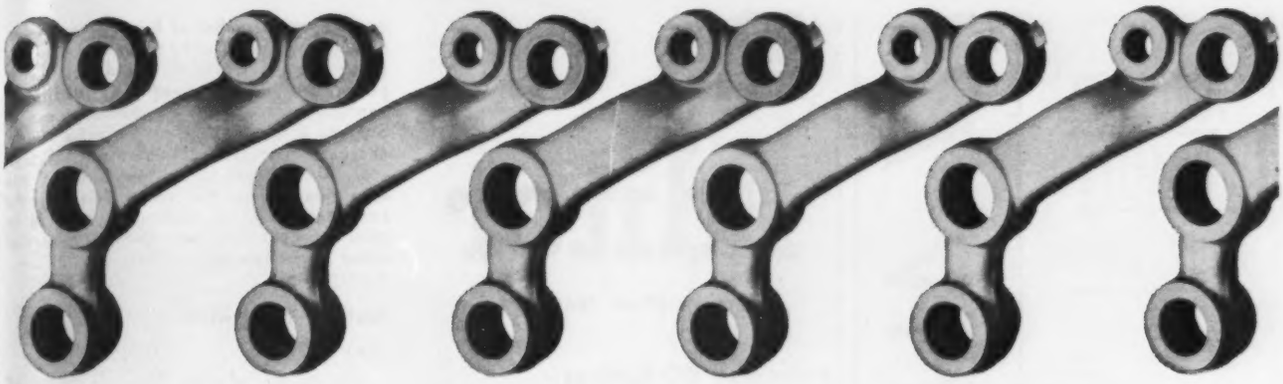
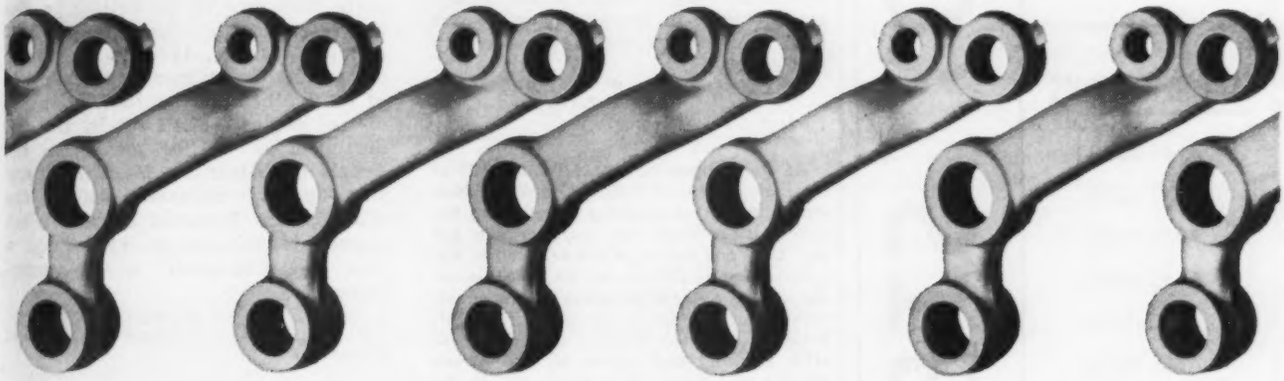


You get uniformity every time



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AMS 6272
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Sir:

Will you please send me what literature you may have for distribution regarding NPA. I am interested chiefly in knowing how to extend any ratings we may receive to our suppliers.

W. B. HARTLEY
General Purchasing Agent
Perfect Circle Corp.
Hagerstown, Ind.

An item appeared on p. 104 and 105 of the Oct. 5 issue of THE IRON AGE which stated: As far as applying or extending the ratings is concerned, the producer must put the "DO" and the two digits supplied to him —for example, DO-39—on his purchase order or on a separate piece of paper attached to the order or clearly identifying it, together with the words "certified under NPA Reg. 2" and signed by the person placing the order. Also, see p. 29 of the Nov. 16 issue.—Ed.

Always Out in Front

Sir:

I have read all of Tom Campbell's editorials. They are all very good. The one in this week's issue (Nov. 9) entitled "Don't Sell Yourself Short" is particularly good. I am looking forward to reading many more.

L. C. PAULSON
Federal Trade Commission
Washington

Keeps A Hand In

Sir:

I would very much appreciate information as to what the percent of operations quoted in THE IRON AGE records of steel operating rates is based on. Operating hours? Various mills in different plants? Capacity rated openhearths, bessemers, blast furnaces, etc.? Or what?

I note Youngstown for a long time past shows 103 to 106 pct. I think long since additional mills or equipment began operating there. Years ago I was in the operating end of steel and tin mills; I am now retired, but of course still very much interested in the business.

W. F. SINGER
Santa Ana, Calif.

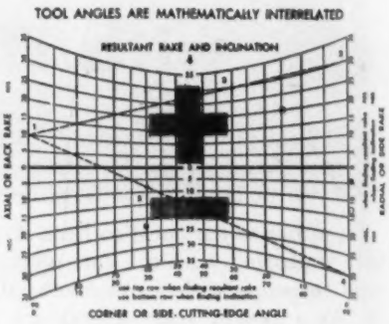
The weekly operating rate published in THE IRON AGE is based on steel ingot production from all types of steel making furnaces in relation to rated capacity. The rated capacity of each steel making company is computed annually or semi-annually and allows for normal down-time for repairs and a normal number of heats according to regular practice. During times when there is great pressure for steel, shut-downs for repairs are often delayed and additional heats are forced by such means as use of oxygen, a higher hot metal ratio in the charge, failure to shut-down for holidays, etc. Also, plants bring new furnaces into operation during the year. This has the combined effect of making it possible to push the operating rate above 100 pct of rated capacity.—Ed.

Author Identified

Sir:

On p. 99 of the Nov. 9 issue of THE IRON AGE a diagram has been published (Fig. 1) showing the correlation of tool angles and resultant rake. This diagram has been previously published in an article by the undersigned in "American Machinist" Jan. 15, 1948, p. 95. It is the result of a rather complex study of the mathematical interrelationship of tool angles carried out by the undersigned as will be seen from the article in "American Machinist" and from papers delivered before the ASME, etc. It would be very much appreciated if you would publish a note and give credit to the undersigned.

M. KRONENBERG
Consulting Engineer
Cincinnati


TOOL ANGLES ARE MATHEMATICALLY INTERRELATED
RESULTANT RAKE AND INCLINATION
AXIAL OR BACK RAKE
CORNER OR SIDE CUTTING-EDGE ANGLE

The diagram shown above was authored by Dr. Kronenberg, but the book from which we abstracted it failed to mention this fact. As a result, we in turn failed to include a credit line.—Ed.

Kindred Spirits

Sir:

The article in the Oct. 19 issue on "Cold Extrusion of 105 mm Shells Saves Steel," by D. I. Brown, was most interesting to me, as I served on an ASME Special Research Committee on this subject during the war. I am wondering if I could have a set of tear sheets of this article to keep with the report we made up at that time as a matter of record. This article will serve very well as a problem for my class in metal processing, for which purpose I also would like to use it.

O. W. BOSTON
Chairman
Dept. of Metal Processing
University of Michigan

SAVES 4½ HOURS . . . Martin-Quaid Co., of Philadelphia, Pa., used the New Aircomatic Process to reduce the time and cost of welding huge stainless steel cylinders used in the manufacture of carpets. They found this revolutionary process cut materials cost 25% . . . and saved 4½ hours working time over the old method – and, at the same time, greatly increased the quality of the finished product.

REDUCES TIME 4/5's . . . Consolidated Welding and Engineering Company, of Chicago, Ill., adopted the new Aircomatic process for welding aluminum separators. Immediately, major production and cost problems were solved: To weld one complete separator assembly took only 90 man hours – about 1/5 the time of other methods.

Further, Aircomatic's high current density and the attendant high welding speed confined the heating effects to the narrow weld-zone . . . completely eliminating distortion.

ELIMINATES LEAKS . . . Griffin & Company, of Louisville, Ky., found Aircomatic's high speed and the ability to make welds without interruption ideally suited to the fabrication of tanks for all-aluminum evaporative coolers. Production time and cost was cut to the minimum, and warpage and distortion were completely eliminated. Thus far, the company has made hundreds of these tanks without a single leak.

BOOSTS PRODUCTION 71% . . . The Stewart-Warner Corporation, South Wind Division, Indianapolis, Ind., join the upper and lower halves of its "Safe-Air Gas Home Heater" with the completely new, high-speed Aircomatic Process. This time-saving, cost-cutting process skyrocketed production 71% . . . and cut manufacturing costs in proportion.

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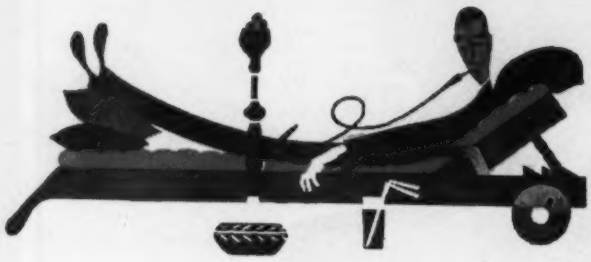

Fatigue Cracks

By CHARLES T. POST

Our Own Newsfront

Chicago reports one far-sighted television set maker is making a change in design that should draw more customers than color television. He is dropping the rectangular screen in favor of a diamond-shaped screen. Idea is better observation of

P S
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Blue Package — Blue Light

Customer relations is a matter of intimate concern with Talon, Inc., the nation's largest zipper manufacturer. Most adjustments sooner or later work their way back to Carl Blass, manager of planning, who has a strong eye for public relations. He likes to tell how a Talon product actually zipped ahead an artistic career.

A young and talented West Coast dancer wrote that she had designed and made a stunning costume for an important performance, which she held together at a crucial spot with a zipper purchased in a blue package. At the height of the dance, the zipper "performed an extra duty," as Blass expresses it, and the garment dropped off. The dancer said she had no knowledge of the mishap "until audience reaction set in, after which I made as graceful an exit as possible." To repair the costume, she wrote that she purchased another zipper in a blue package. Her next performance was the climax of her career—a dance recital in the vast Hollywood Bowl. The second zipper, she wrote, performed the same as the first.

In her closing paragraph she posed this question: "I am an artist, not an ecydasiast [strip teaser, to you]. Should I continue to buy the zippers in the blue package for my costume?"

Talon, not having any pictures to aid its decision, begged the question, sent her with their compliments several zippers in blue packages with which to continue her successful career.

Puzzlers

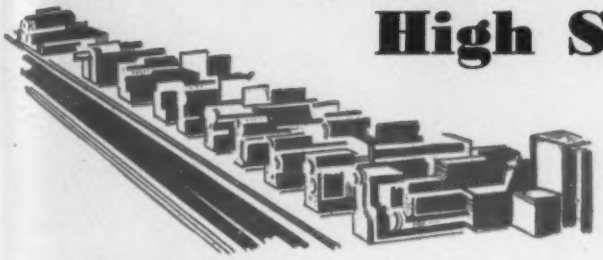
A great silence has greeted last week's problem on the oil drum. We're turning it over to the brains department, which knows everything.

Correct answers on the tire dealer come from William W. Beyers, Buflovak Equipment Div. of Blaw-Knox, R. E. Deaux of the Coolerator Co., Donald E. Jacobson, Los Angeles, and Roger Haydock, Jr., of Monogram Products. John E. Toth, Babcock & Wilcox, is another of the select few to solve the inclined plate and balls puzzler.

John P. Catlin, Remington Arms Co., Inc., writes: "I would very much like to throw in 'my two cents' about the recent problem of the amount of material removed by drilling a 2-in. hole in a 2-in. bar. The late Charles P. Steinmetz, the electrical wizard, according to one of his biographers, solved this problem in his head without use of either pencil or paper when one of his colleagues at General Electric Co., proposed it."

He then poses this one: "A 2-in. cube has 1-in. holes bored through the center of three mutually perpendicular faces, the holes passing completely through the cube. What is the volume of material removed?

MACHINE TOOL
High Spots



Sales Inquiries and Production

By W. A. LLOYD

Danger of Shortages—One of the curious irregularities of the defense program was unfolding this week in the machine tool industry where, while a tremendous potential demand was taking shape, production is being jeopardized by a shortage of materials.

Despite a 12-month backlog at the current rate of production, shipments are not increasing, and industry sources fear that a serious impasse is practically at hand.

Top Priority Needed—Tell Berna, general manager of National Machine Tool Builders' Association, warned that "what is needed is an immediate top priority for what the industry needs in materials. War begins with machine tools."

Most hopeful sign of a priority to date is the appointment of an investigator by National Production Authority to explore and report on the raw material situation.

In the meantime, the industry will probably continue to lose men.

October Orders Rise—New orders for machine tools in October rose to a preliminary index figure of 290.5, compared with a September index of 280.6, National Machine Tool Builders' Assn. reported. Foreign orders in October rose to a preliminary index figure of 48.8, nearly double the September index of 27.2. October shipments dropped fractionally to an index figure of 101.1, compared with 101.6 in September. Ratio of unfilled orders to shipments rose to 11.6 to 1, compared with 9.8 to 1 at the end of September.

Used Market Perks Up—One of the by-products of the present boom, which one expert has chosen to call the "arsenal economy," is the demand for good used machine tools. A year ago, sale of a new machine was often dependent on the price the machine it was replacing would bring in the used machinery market.

Prices of good used machines today are at an all-time high, but deliveries on new machines are greatly extended. Also, companies buying new machines can see plenty of opportunity for sub-contract work in the months ahead and are not releasing this equipment to the used dealer.

Reactivates Metal Plant—In Akron, Ohio, Goodyear Tire & Rubber Co. is reactivating its wartime aircraft plant at Litchfield Park, Arizona, to manufacture metal components for aircraft and air-envelopes for lighter than air ships. During World War II the plant was used as a modification center for B-24 bombers and to manufacture outer wing panels for other aircraft.

Goodyear also is constructing a $1,000,000 addition to its belt plant in Lincoln, Neb. When completed, next July, the new building will add over 100,000 sq ft to the plant's floor space and increase production facilities by 50 pct.

Rocket Program Expansion—In Los Angeles, Aero Jet Engineering Corp. is completing construction of a 56,000 sq ft addition to its Azusa, Calif., plant. New facilities include a production machine shop, which was necessitated by the accelerated rocket program, accommodating 400 machinists a shift, and more than doubling the firm's available machine shop space.

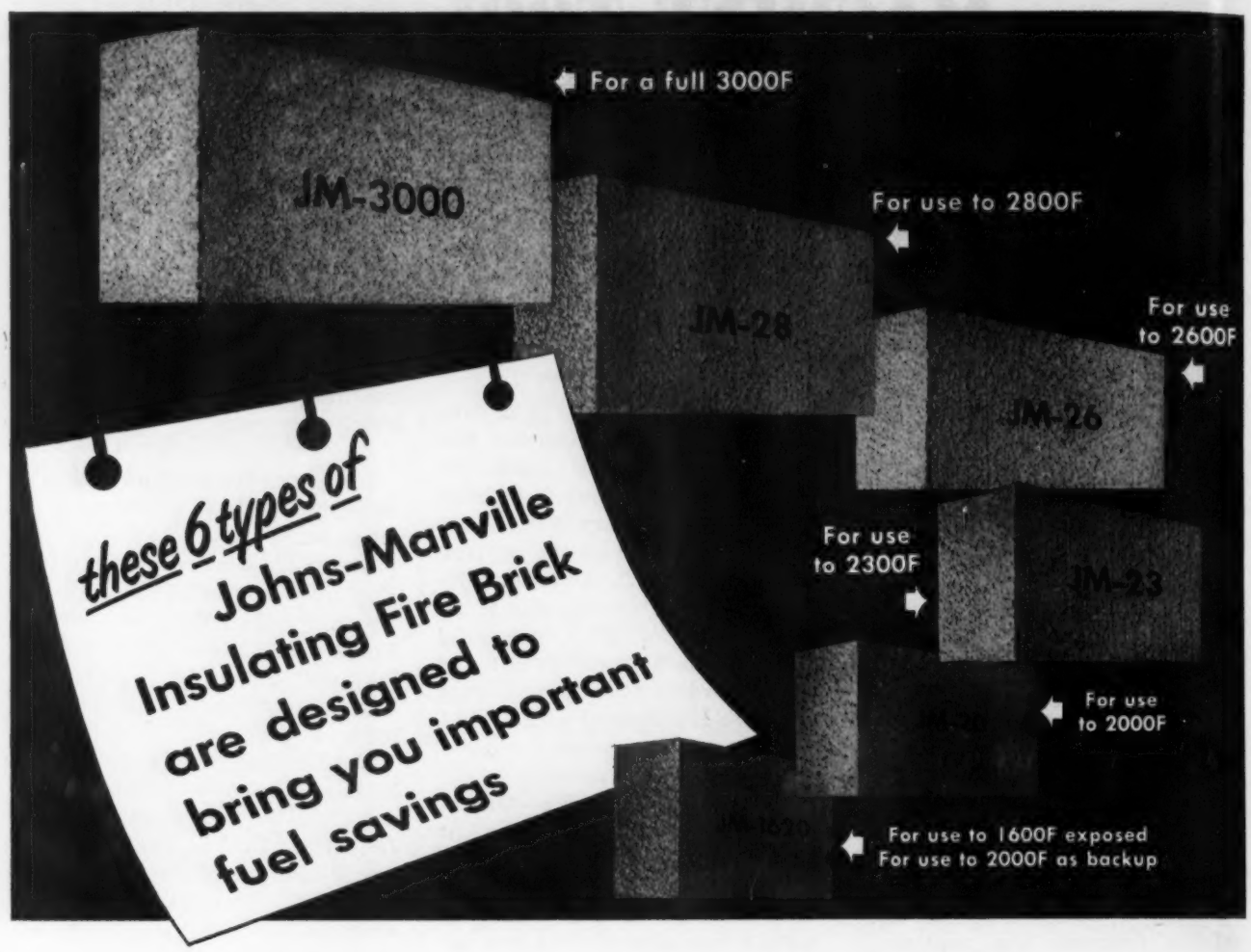
Sikorsky Helicopters—In Bridgeport, Conn., a license agreement under which Sikorsky 10-place helicopters will be built in England by Westland Aircraft, Ltd., largest helicopter plant in Europe, has been announced by Sikorsky Aircraft Division of United Aircraft Corp. and Westland.

The British concern has been building a smaller helicopter under a similar agreement signed in January 1947. The Pratt & Whitney R-1430 engine, will be used, but Westland will explore the possibilities of installing a British designed power unit.

Correction—In THE IRON AGE, Nov. 16, this column, size of the machine tool program for Holland was erroneously stated. Holland has at present three projects outstanding, calling for a total of $1,344,000 in machine tools.

Revise Cost Estimate—In Cleveland, National Machine Tool Builders Assn. released a bulletin indicating that the cost of the government - sponsored machine tool project in India, which was originally estimated at $37.8 million, will only cost $19.95 million and the value of production will be $8.4 million per year as against the previous estimate of $18.8 million, according to the latest information.

Out of the capital cost of $19.95 million, $16.9 million is to be spent on factory, plant, and equipment, and the balance of $3.05 million on housing and miscellaneous expenditures. The project will be completed within 5 years.



You can make important savings in fuel by taking advantage of the quick heating characteristics of J-M Insulating Fire Brick. These light-weight brick permit a quicker rise to proper operating temperature in the furnace because of their low heat storage capacity, and low thermal conductivity. Where furnaces are being intermittently operated these are two especially important characteristics.

These same insulating materials can also be obtained in large size units called Johns-Manville Insulating *Fireblok*. This product has many advantages over the smaller size fire brick for certain types of jobs . . . from both a construction and stability standpoint. The Fireblok units can be quickly applied because they are easy to cut and fit. Fireblok insulations provide additional heat savings because they reduce the number of joints, and require less mortar for bonding.

It will pay you to let a Johns-Manville insulation engineer explain the many ways in which you can save by using these insulations in your furnaces. Just write for further information to Johns-Manville, Box 290, New York 16, N.Y.

	JM-1620	JM-20	JM-23	JM-26	JM-28	JM-3000
Densities, lb per cu ft	29	35	42	48	58	63-67
Transverse Strengths, psi	60	80	120	125	120	200
Cold Crushing Strengths, psi	70	115	170	190	150	400
Linear Shrinkage†, percent	0.0 at 2000 F	0.0 at 2000 F	0.3 at 2300 F	1.0 at 2600 F	4.0 at 2800 F	0.8 at 3000 F
Reversible Thermal Expansion, percent.	0.5—0.6 at 2000 F †	0.5—0.6 at 2000 F	0.5—0.6 at 2,000 F	0.5—0.6 at 2000 F	0.5—0.6 at 2000 F	0.5—0.6 at 2000 F
Conductivity* at Mean Temperatures						
500 F	0.77	0 97	1.51	1.92	2.00	3.10
1000 F	1.02	1.22	1.91	2.22	2.50	3.20
1500 F	1.27	1.47	2.31	2.52	3.00	3.35
2000 F	—	1.72	2.70	2.82	3.50	3.60
Recommended Service						
Back up	2000 F	2000 F	2300 F	2600 F	2800 F	3000 F
Exposed	1600 F	2000 F	2300 F	2600 F	2800 F	3000 F

†24-hr. simulative service panel test for JM-3000; 24-hr. soaking period for other brick.

*Conductivity is expressed in Btu in. per sq ft per F per hour at the designated mean temperatures.

Note: Above tests are in accordance with A.S.T.M. tentative standards.

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Another cost-saving advantage for users of
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MECHANICAL
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SIZES—Up to 9⅝" O.D. in full range of wall thicknesses.
QUALITY — Open-hearth and electric furnace steels, including aircraft and magnaflux qualities.
CONDITION — Unannealed, annealed, tempered, normalized, or otherwise heat-treated as required.
SURFACE FINISHES — As rolled, as drawn, as welded, flash removed, turned, scale-free, and polished.
SHAPES — Round, square, rectangular, oval, streamlined, and special shapes.
FABRICATION — Upsetting, expanding, bending, safe-ending, and machining.
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PUBLICATIONS

New publications that describe money saving equipment and services are available free and without obligation. Copies can be obtained by filling in the attached card and mailing it.

Liquid Rheostat

Construction and operating features of Allis-Chalmers liquid rheostat Type 257, which provides stepless, wide range speed control of wound rotor motors, are described in a new leaflet. The rheostat's stepless speed control is especially desirable for variable torque loads such as induced and forced draft fan drives, centrifugal pumps, blower and compressor drives, and is also suitable for load absorption and motor starting applications, according to the leaflet. The unit is shown to be safe, compact, has only a few moving parts, and gives full resistance range in 10-in. travel. *Allis-Chalmers Mfg. Co.*

For free copy insert No. 1 on postcard.

Stop and Check Valves

A new 8-p. instruction bulletin describes the function and features of G-A triple action non-return valves. A general list of materials used in the valves is presented, and available sizes and designs are listed. Cross-sectional drawings illustrate the construction features of the three different body and yoke patterns available. Sections of the booklet are devoted to discussions of valve care, installation and sequence of operation. *Golden-Anderson Valve Specialty Co.*

For free copy insert No. 2 on postcard.

Steam-Detergent Cleaning

An account of how steam-detergent cleaning saves time, saves work and cuts costs on many industrial cleaning operations is provided in a new illustrated folder. The folder emphasizes that the high effectiveness of steam-detergent cleaning is due to the simultaneous application of three different actions: (1) the physical action of steam pressure and hot water working their way through successive layers of grease and dirt; (2) the dissolving action of heat on oil, grease and other deposits; and (3) the chemical action of the detergent in wetting, penetrating and emulsifying surface deposits. Typical job in metalworking plants where steam-detergent cleaning provides substantial economies are reported in the folder. *Oakite Products, Inc.*

For free copy insert No. 3 on postcard.

New Electrode Guide

Pocket size for easy reference, a new 56-p. electrode guide has page tabs marking the various classifications of P & H welding electrodes. A helpful feature is the 2-p. comparative chart which lists corresponding types of electrodes. The booklet also includes a description of each electrode, typical applications and the sizes which are available. *Welding Div., Harnischfeger Corp.*

For free copy insert No. 4 on postcard.

Motorized Reducer

The new all-steel right angle Falk Motoreducer, which combines the advantages of their standard type with the adaptable right angle head, is described in a new 16-p. bulletin. The unit can be used for either horizontal or vertical applications and is available with output shaft single or double ended, as shown in the booklet. The all-steel construction guarantees greater rigidity, strength and motor adaptability. Selection information, dimensions, rating tables and service factors are provided. *Falk Corp.*

For free copy insert No. 5 on postcard.

Gap Press Bulletin

A new line of single-crank open back inclinable and gap presses is described in a new 8-p. bulletin, with illustrations of the two basic designs which make up the line; the booklet contains a detailed description of construction; a description and diagram of the newly-developed Columbia Alcone clutch used on larger models, and specifications of all models from 10 to 200 tons capacity in the inclinable type and to 200 tons capacity in the gap type. *Columbia Machinery & Engineering Corp.*

For free copy insert No. 6 on postcard.

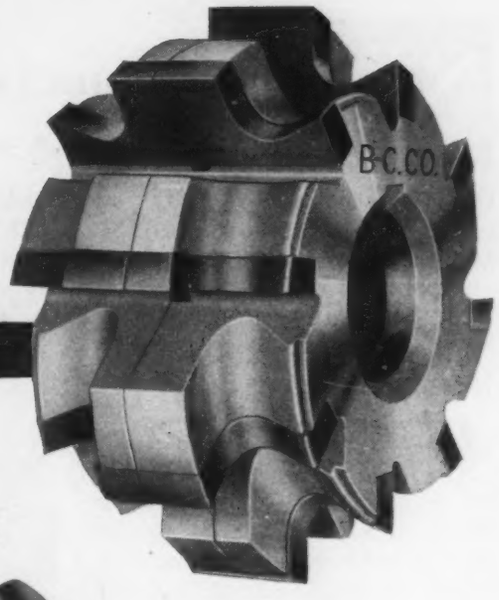
Vibrating Screens

Link-Belt "CA" concentric action vibrating screens for medium and heavy duty service, accurate sizing, thorough rinsing and rapid dewatering of a wide range of materials, are shown in a new 12-p. booklet. Vibrating screens described are made in sizes ranging from 3-ft wide by 8-ft long to 6-ft wide by 16-ft long screening surface; in single, double or triple deck models; and for suspended or

Turn to Page 101

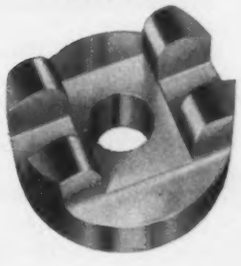
YOU SUPPLY THE FORM...

BARBER-COLMAN
WILL FURNISH THE CUTTERS



TO

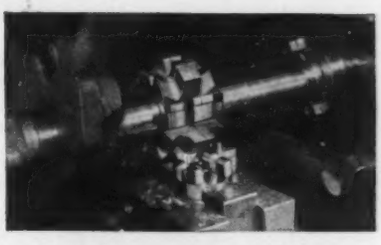
COMBINE CUTS
PROLONG TOOL LIFE
SPEED OPERATIONS
DUPLICATE ACCURACY
MAKE THE JOB EASIER



Intricate forms, combined cuts, difficult milling problems — these are cutter jobs we like.

Using experience gained from many kinds of milling problems, Barber-Colman engineers develop tooth forms to produce maximum results in tool life, feeds and speeds, combining cuts and duplicating accuracy. This experience pays off for many Barber-Colman cutter users in eliminating trouble factors and making jobs easier.

Formed cutters include ground and unground, straight and helical gashes, form-relieved and profile styles. Just send us blue prints showing the form you wish to produce, and we will quote cutters engineered to suit the particular requirements of the job.

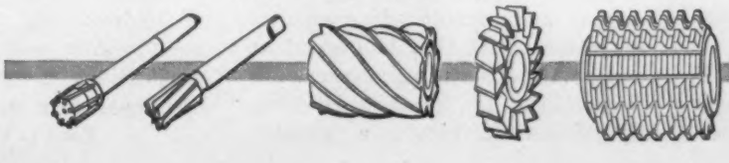


Barber-Colman Form-Relieved Cutters Mill 5 Surfaces; Pieces per Sharpening increased to 6000

Two sets of carbide-tipped form-relieved milling cutters are used to form-mill 1/8" stock from all sides of the bosses on this hi-tensile manganese, phosphor bronze casting. One set combines angular, radius, vertical and flat cuts in one pass. The other set mills slot, shoulders and radii in one operation. Speed of 529 rpm. and feed of 12.5" per minute are used. Tool life has been increased from 200 to 6000 pieces per sharpening.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 1848 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN

NEW PRODUCTION IDEAS

Continued

the independent factors of load or input pressure. Regulators can be furnished to control flow rates from 0.1 gpm up to any practicable size. *W. A. Kates Co.*

For more data insert No. 20 on postcard, p. 35.

Hardness Tester

Automatically tests, and certifies the hardness of sheet metal parts.

The new hardness testing assembly includes an adaptation of a Barcol unit and can be set for the desired hardness. By means of a conversion chart, Brinell, Rockwell or Vickers numbers can be certified. Pieces to be inspected are fed between needle and anvil of the unit and when the point contacts the part, a dial reading is visible and a

green light flashes if the piece is of the required hardness. A stamp automatically certifies the piece and a counting device registers the total pieces inspected. When a metal part is not of the required hardness, the light will not flash. *Topflight Tool Co.*

For more data insert No. 21 on postcard, p. 35.

Special Drill Press

Drills lightening holes in tractor crankshafts of 56 in. overall length.

When the workpiece is located in the fixture of the machine, it is clamped in place by means of a manually controlled hydraulic mechanism. The workpiece is then indexed through six stations at each of which two 1½-in. holes are drilled in the cheeks of the crankshaft adjacent to one of the throws. The indexing unit is power operated but is manually controlled, with final adjustment by means of a handwheel. The machine can be set for any desired number of stations

for handling other size crankshafts. Drills up to 2 in. can be used, a change gear transmission being provided for speed adjustments. The 1½ in. drills are driven at 50 fpm and have a minimum infeed of 1 ipm with rapid advance and retraction. Stroke is 15 in. on both guide bar units. *Snyder Tool & Engineering Co.*

For more data insert No. 22 on postcard, p. 35.

Grinding Unit

For grinding pistons that require a taper to conventional relief form.

The unit grinds the desired shape by holding the automotive or other piston between centers, with the head end of the piston being carried in a dog or holder, and centered on the master cam spindle center. The bottom end of the piston is supported on a special footstock center carrying a spherical ball bearing, that becomes a pivot about which the piston revolves and oscillates according to the motion of the rocking bar as

imparted by the master cam. The motion and corresponding amount of piston relief that is ground at any point between these centers are proportional to the distance from the footstock pivot; a greater amount of relief is ground at the head of the piston than at the bottom of its skirt. *Norton Co.*

For more data insert No. 23 on postcard, p. 35.

Motor Starter

Features Life-Linestarter, circuit breaker, and interlocked handles.

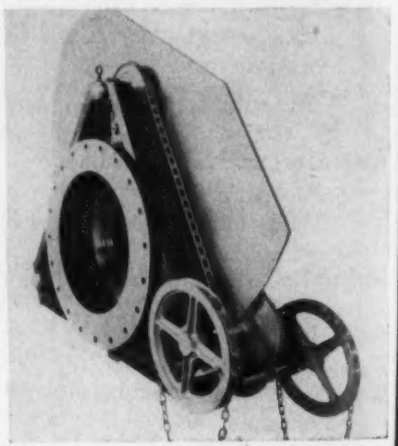
A new combination Life-Linestarter is designed for across-the-line starting of squirrel cage induction motors, or as a primary switch for wound rotor motors. With capacities from ¼ to 100 hp, and 100 to 600 v polyphase, the unit is available in NEMA sizes 0 through 4, and NEMA type enclosures 1, 1A, 3, 4, 5, 7, and 9. *Westinghouse Electric Corp.*

For more data insert No. 24 on postcard, p. 35.

Goggle Plate Valve

Fast positive mechanical operation with protection against leakage.

Higher structural strength has been combined with other new features, in the Brosius Westling goggle plate valve. The valve operates so simply that it can be opened or closed by one man in from ½ to 3 min depending on size. The valve can be operated manually or it can be motor driven and interlocked when the service warrants the extra cost. *Edgar E. Brosius Co., Inc.*



For more data insert No. 25 on postcard, p. 35.

Stainless Steel Bellows

Hydraulically formed, in sizes from 7/16 to 26⅜ in. diam.

Flexibility, strength, corrosion resistance and leakproof qualities of hydraulically formed stainless steel bellows make them suited for applications involving the control of temperature and pressure, shaft

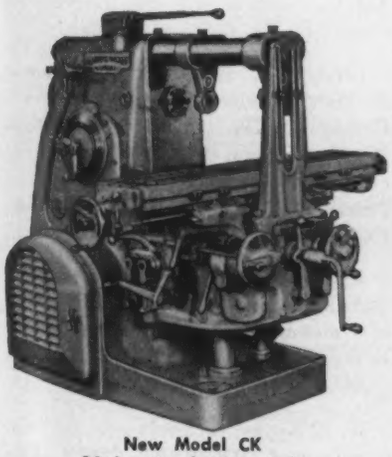
Turn to Page 102

GREATER VERSATILITY

Kearney & Trecker's new CK milling machines are designed for most effective use of modern cutting tools. Their wide speed and feed ranges are closely suited to nearly all general purpose milling on most kinds of ferrous and non-ferrous metals and alloys. On all CK machines you can select from 24 spindle speeds ranging from 15 to 1500 rpm on No. 2 and 3 size machines — and 13 to 1300 rpm on No. 4, 5 and 6 sizes. For quiet effortless speed changing, the new automatic Protecto-mesh shift eliminates gear clashing. All CK machines are equipped with the extra-wide feed range, ⅜" to 90" per minute, with separate motor drive for feed and rapid traverse movements.

A new line of knee-type milling machines

KEARNEY & TRECKER MILWAUKEE **CK's**



New Model CK
10 hp No. 2 Plain Style
Milling Machine

YES, Kearney & Trecker's new CK milling machines are packed with design and operating features that make them *more productive, more profitable for you.*

Spindle-mounted flywheel, broad feed and speed ranges and greater horsepower with separate motor drives for spindle, and feed and rapid traverse, mean you get fullest possible benefit from modern cutting tools.

New CK columns give you greater rigidity. Compared to former columns, they give you 1000 pounds more metal in heavier ribbing, in box-type, sponson construction to absorb vibration from heaviest cutting loads.

For greater production, these machines are equipped with Kearney & Trecker's famous Mono-Level Control that shortens floor-to-floor time, and materially reduces operator fatigue. New, non-glare micrometer dials help avoid costly errors in reading . . . give you a positive lock at every setting.

Automatic flood lubrication in column and knee and positive metered lubrication to table and saddle, plus generously proportioned gears and shafts assure you greater machine life.

Find out for yourself about Kearney & Trecker's new CK line of knee type milling machines . . . how they meet every demand of modern milling practice . . . how they can give you greater production at greater profit.

Sizes are No. 2, 3, 4, 5, and 6 . . . Plain and Universal styles. For complete details, contact your nearest representative or write direct. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

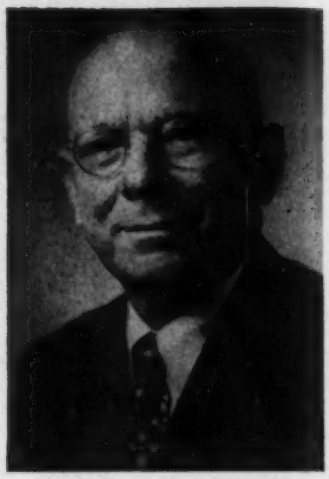
REPLACEMENT OF OBSOLETE MACHINE TOOLS IS AN INVESTMENT THAT MAKES BOTH DOLLARS AND SENSE

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Iron Age *Introduces*

VINCENT W. SUELLAU, appointed director of sales, General Chemical Div. of Allied Chemical & Dye Corp., New York.

S. E. BIGGS, elected a vice-president of the Trailmobile Co., Cincinnati.



FRANK J. SMITH, elected vice-president in charge of iron ore operations for Oglebay, Norton & Co., Cleveland.

J. A. W. Iglehart, elected chairman of the Board of ROTARY ELECTRIC STEEL CO., Detroit. Mr. Iglehart succeeds **L. E. Creighton,** who has retired. **J. A. Shimmin,** named assistant general superintendent and **C. Melvin Smith,** appointed chief engineer.

George R. Siegrist, executive vice-president, treasurer and director of ACHESON COLLOIDS CORP., Port Huron, Mich., is retiring after thirty years with the firm.

Harry L. Emerson, appointed vice-president in charge of manufacturing, Rockford Clutch Div. of BORG-WARNER CORP., Chicago. Mr. Emerson will continue as works manager.

J. B. Ward, vice-president and general manager, and **W. H. Casson,** vice-president in charge of manufacturing, named directors of ADDRESSOGRAPH - MULTIGRAPH CORP., Cleveland.

Edward G. Johnson, named purchasing agent for LACLEDE STEEL CO., St. Louis. **John D. Jackson,** made assistant purchasing agent to succeed Mr. Johnson.

J. N. Candler, appointed vice-president and assistant general manager of MORSE CHAIN CO., Chicago. **R. J. Howison,** formerly general sales manager, made vice-president in charge of sales; **E. W. Deck,** formerly manager, Ithaca Plant, vice-president in charge of manufacturing, in Ithaca. **M. V. Durkin,** formerly manager, Detroit plant, chosen vice-president in charge of manufacturing, Detroit; **W. M. Reynolds,** secretary and treasurer and **E. G. Wuensch,** assistant treasurer.

Howard E. Jenkins, appointed manager, eastern territory, for E. C. ATKINS & CO., Indianapolis. Mr. Jenkins' headquarters will be in New York City.

James J. Filas, named manager of the newly created Fastener Div., of ACME STEEL CO., Chicago. Mr. Filas was formerly in charge of stitching machine activities in the Central Div.

W. M. Teets, has been transferred from the laboratory staff to the sales force by HANSON-VAN WINKLE-MUNNING CO., Matawan, N. J.

James S. Denham, general manager, Photo Products Dept. of E. I. du PONT de NEMOURS & CO., INC., Wilmington, Del., will retire Dec. 1. Mr. Denham will be succeeded by **Samuel G. Baker,** who is now general manager, Electrochemical Dept. **Donald O. Notman** will fill the vacancy caused by Mr. Baker's transfer.

Clinton F. Robinson and **Duncan C. Menzies,** elected director of FANSTEEL METALLURGICAL CORP., North Chicago, Ill., to fill vacancies created by the recent resignations of **James M. Troxel** and **Robert H. Harrison.**

Lloyd A. Russ, formerly manager, Specialties Sales Dept., named director of management development for WESTINGHOUSE ELECTRIC CORP., Pittsburgh.

W. E. Noyes, formerly general sales manager of DIVERSEY CORP., Chicago, named vice-president in charge of sales.

W. F. Weimer, named advertising manager of ROCKWELL MFG. CO., Pittsburgh. Mr. Weimer succeeds William A. Marsteller, who recently resigned.

Richard Brown, named director of personnel, Ingersoll Steel Div., Kalamazoo, Mich., of BORG-WARNER CORP., Chicago. **Dee Williams,** appointed employment supervisor.

C. R. Brown, appointed purchasing agent, Canton Div., for E. W. BLISS CO., Detroit.

C. O. Richards, appointed purchasing agent for PENNSYLVANIA PUMP & COMPRESSOR CO., Easton, Pa.

William F. Hagen, formerly field engineer, named assistant district manager, New York office, for SKF INDUSTRIES, INC., Philadelphia.

Malcolm H. Gotterer has joined the SURPLUS & SALVAGE CORP., Jamestown, N. Y.

Robert A. Bode, named sales manager and **J. James Tasillo,** assistant sales manager for HARTFORD SPECIAL MACHINERY CO., Hartford Conn.

M. D. Ayers, appointed chief engineer of WHEELING STEEL CORP., Wheeling, W. Va.

Thomas J. O'Connell, appointed chief of yard and terminal operations of the BALTIMORE & OHIO RAILROAD CO., Baltimore.

D. B. Bishop, named manager, Pittsburgh office, of the DEARBORN CHEMICAL CO., Chicago. Mr. Bishop succeeds **J. A. Crenner,** who recently retired after 37 years with the firm.

Robert G. Cady, named sales manager for the AJAX FLEXIBLE COUPLING CO., Westfield, N. Y.

John L. Nolan appointed sales representative for A. B. MURRAY CO., INC., Elizabeth, N. J.

Arthur H. Lauder, named manager of engineering, Large Motor & Generator Divs. of GENERAL ELECTRIC CO., Schenectady, to succeed Earle S. Henningsen, deceased.

Robert M. Brown, appointed assistant purchasing agent for NATIONAL TUBE CO., Pittsburgh.

Milton G. Peck, appointed sales manager for the recently introduced line of powered hand trucks for CLARK EQUIPMENT CO., Battle Creek, Mich.

Allan W. Walter, elected comptroller of PULLMAN, INC., Chicago.

Iron Age Salutes

WILLIAM H. WORRILOW

BE it a church drive, a new community project, or a question on Pennsylvania folklore, folks just naturally look to Bill Worrilow for the answers. And he has them ready.

Talk steel castings almost anywhere and the name of Bill Worrilow will be mentioned. After 59 action-crammed years in the century-old industry he is still going strong. As master salesman and management leader his voice and opinions are hearkened to on both sides of the Atlantic.

As president of Lebanon Steel Foundry, Mr. Worrilow has cast one of the industry's most impressive success stories. The 50 x 100 ft shed where in 1911, with Thomas S. Quinn and a handful of employees, he set up business, has long since been outgrown. The plant today, with modern factory buildings and equipment, covers 37 acres. And among the 600 to 1000 employees are some who started with the boss.

Bill Worrilow was born at Chester, Pa., foundry industry hub, in 1877. He received a Doctor of Law degree from Lebanon Valley College, Anneville, Pa.

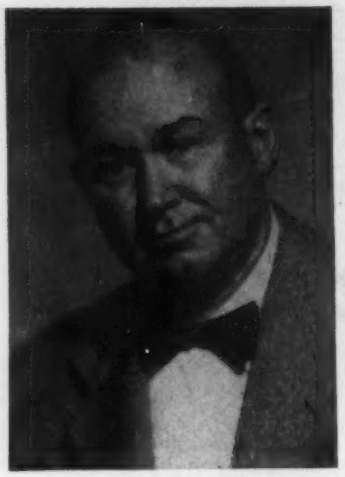
His first job was with the Johnson Frog & Switch Co. in 1891. Next year he joined Standard Steel Casting Co. and continued with the successor company, American Steel Casting Co., until 1904, when he was made assistant district manager at Pittsburgh. From 1904 to 1907 he was sales manager for Solid Steel Castings Co., and from 1907 to 1911 he held a similar position with Lebanon Steel Castings Co.

In 1948 the American Society for Metals' distinguished service award for promotion and development of alloy steel castings went to Bill Worrilow. For several years Mr. Worrilow was a director of Steel Founders' Society of America, and served as president of the Society in 1931-32. He was one of the founders of the Alloy Casting Assn. and its first president. Later he served as president of the Alloy Casting Institute.

During World War II he was a member of the steel and alloy casting advisory committee of the War Production Board, and largely responsible for introduction of an advanced type of cast armor plate.

Study is relaxation for Bill Worrilow. He is an authority on Pennsylvania folklore, author of a book on the life of James Lick, and sparked publication of the recent "A History of Steel Casting."

He has two sons following in the business. William H., Jr., is assistant sales manager, and John L., formerly in the sales department, is now in Korea, a lieutenant in the marines.



H. B. BROWN, named assistant general sales manager for Inland Steel Products Co., Milwaukee.

JOHN C. SCOTT, appointed superintendent of industrial relations, Waukegan Works, of American Steel & Wire Co., Chicago.

JAMES A. BARDSLEY, named a vice-president of the Trailmobile Co., Cincinnati.

J. William Geisler has joined the staff of the FISHER SCIENTIFIC CO., Pittsburgh.

Frank G. Davis will retire Dec. 31 as general sales manager of the PENINSULAR STEEL CO., Detroit.

J. Gordon Ridsdale, appointed to the newly created office of manager of defense production for AMERICAN DISTRICT STEAM CO., INC., North Tonawanda, N. Y.

Eugene K. Miller, Jr., named superintendent of blast furnaces, Gary Works, of CARNEGIE-ILLINOIS STEEL CORP., Pittsburgh.

Robert A. Harris, named chief improvement engineer, Production Dept., for AMERICAN CAR & FOUNDRY CO., New York.

Carl G. Holmes, appointed to the Pittsburgh district sales staff of HARBISON-WALKER REFRACTORIES CO., Pittsburgh.

Frank M. Hall, appointed plant superintendent for ACHESON COLLOIDS CORP., Port Huron, Mich., to succeed Alfred E. Emms, who retired recently.

James A. St. Louis, promoted to manager, Cuyahoga Lamp Works, at Nela Park, Cleveland, for the GENERAL ELECTRIC CO., Schenectady.

John L. Davis, Jr., named sales manager, Railroad, Pig Iron and Coal Chemicals Divs. of INLAND STEEL CO., Chicago. **L. C. Read,** made assistant manager of sales, Railroad Products Div., and **A. C. Engh,** assistant manager of sales, Pig Iron and Chemicals Div.

Edgar F. Wait, named general manager, Highland Park Div., of FORD MOTOR CO., Dearborn, Mich.

Walter Schmidt is now assistant product engineer at CHEVROLET CENTRAL ENGINEERING. Mr. Schmidt was formerly resident engineer at Chevrolet-Flint assembly plant.

John W. Reavis, elected a member of the executive committee of JONES & LAUGHLIN STEEL CORP., Pittsburgh.

T. A. Torrence, product manager, Oil Div. of Aluminum Co. of America, Pittsburgh, re-elected to second term as director of the PACKAGING INSTITUTE, New York. **Roger V. Wilson** of the Continental Can Co., New York and **Walter E. Daley** of New Haven Pulp & Board Co., New Haven, Conn., were named directors. **Charles O. Kendall** of E. R. Squibb & Sons, elected president.

Dr. Edward M. Pritchard, appointed chief electrical engineer of the CONTROL ENGINEERING CORP., Canton, Mass.

Harold L. Cramer, appointed manager, Agency and Construction Dept. for WESTINGHOUSE ELECTRIC CORP., Pittsburgh. Mr. Cramer was formerly agency and specialty manager for the eastern district, at New York.

D. R. Meckstroth, elected chairman, General Marketing Committee of the GAS APPLIANCE MANUFACTURERS ASSN., New York. **L. C. Reese,** named vice-chairman.

E. J. Cloutier, Jr., formerly with Tinnerman Products, Inc., Cleveland, is now associated with the STANDARD PRODUCTS CO., Cleveland.

E. Claude Jeter, former plant manager, Dearborn Iron Foundry of the FORD MOTOR CO., Dearborn Mich., appointed manager of the new production foundry at Cleveland.

Eric W. Hammerstrom, manager, Building Products Section, of Reynolds Metals Co., Richmond, Va., has joined the Building Products Div. of the NATIONAL PRODUCTION AUTHORITY, Washington.

Paul J. Roddy, appointed assistant domestic sales manager for NICHOLSON FILE CO., Providence, R. I. Mr. Roddy succeeds **Edmond A. Neal,** who was promoted to domestic sales manager.

H. B. DeVinny, named director of industrial relations for DAVIDSON CHEMICAL CORP., Baltimore. **Russell E. Marks** succeeds Mr. DeVinny as assistant director of industrial relations. **W. N. Watmough, Jr.,** elected vice-president.

George A. Wampler, former sales representative Memphis district office for ALLIS-CHALMERS MFG. CO., Milwaukee, named manager of the Chicago warehouse sales unit.

OBITUARIES

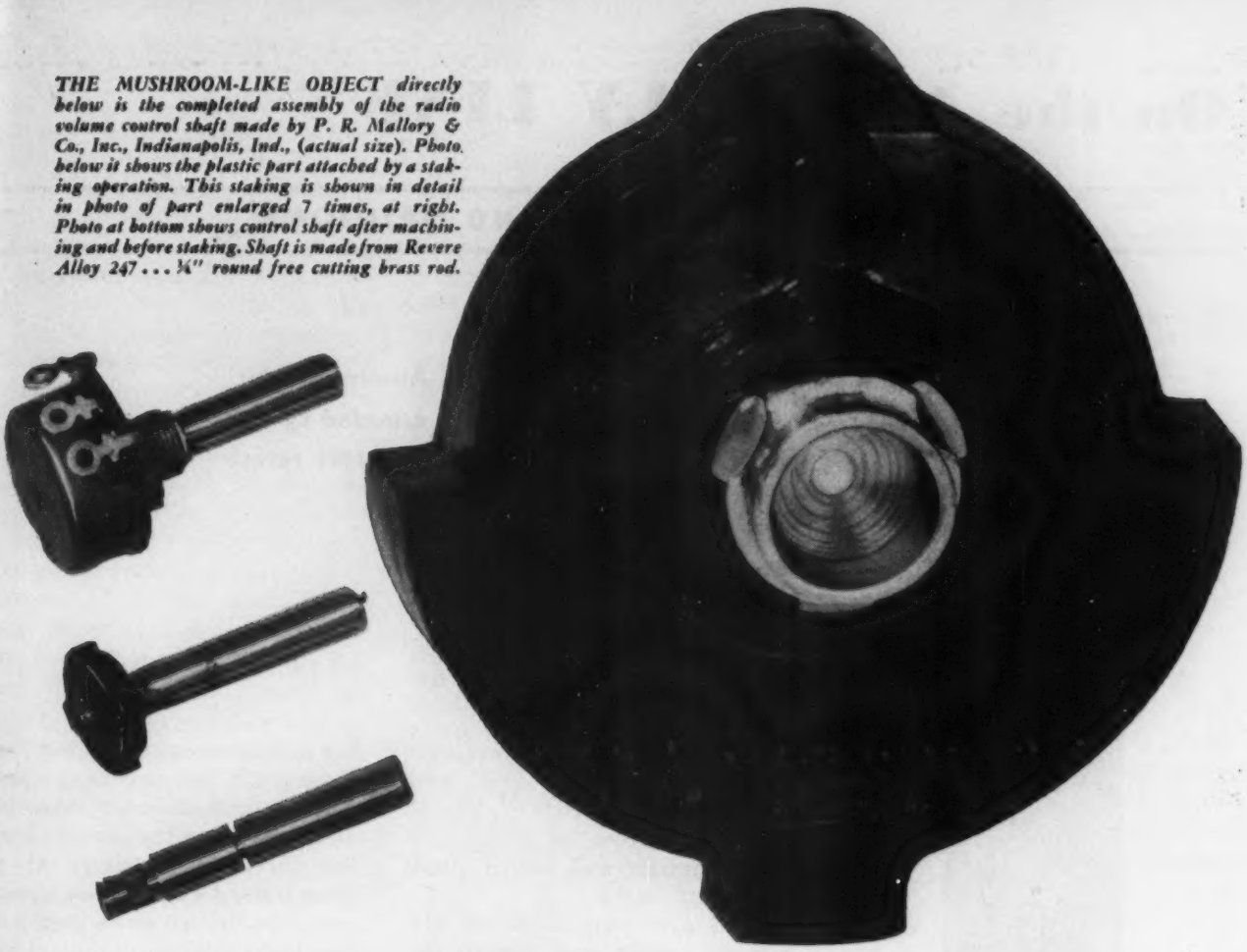
Sherman E. Bradford, 46, general foreman, by-products plant of Woodward Iron Co., Woodward, Ala., passed away recently.

William Davis Moore, 68, retired president of the American Cast Iron Pipe Co., Birmingham, died recently.

Charles Henry Woolley, 44, assistant manager, Proposition Dept. of Babcock & Wilcox Co., New York, died Nov. 11.

Franklin Johnston, 72, secretary and purchasing agent of the Moline Tool Co., Moline, Ill., passed away Nov. 12.

THE MUSHROOM-LIKE OBJECT directly below is the completed assembly of the radio volume control shaft made by P. R. Mallory & Co., Inc., Indianapolis, Ind., (actual size). Photo below it shows the plastic part attached by a staking operation. This staking is shown in detail in photo of part enlarged 7 times, at right. Photo at bottom shows control shaft after machining and before staking. Shaft is made from Revere Alloy 247 . . . ¾" round free cutting brass rod.



BY SWITCHING TO REVERE FREE CUTTING BRASS ROD P. R. MALLORY & CO., INC.,

SAVES ON 2 COUNTS!

Staking operation on radio volume control shaft performed without fracture . . . annealing operation eliminated.

The solution to the Mallory Company's problem was not as easy as it might appear. It was not simply a case of Revere Technical Advisory Service recommending ¼" round, free cutting brass rod. That rod had to possess the machinability to match Mallory's existing production machine set-up and at the same time be sufficiently workable so that annealing, prior to staking, could be eliminated; and that staking be accomplished without fracturing the metal.

After consulting with the Mallory Engineers, and discussing the tests which Mallory would subsequently conduct, Revere recommended a ¼" round, half hard riveting and turning rod mixture 247. Working tests made by Mallory showed this rod to possess all the necessary requirements.

As a result of those tests, P. R. Mallory & Company is now using this Revere free cutting brass rod to its complete satisfaction for the radio volume control shafts it manufactures. Not just any ¼" brass rod, but the *right* rod made it possible for them to save on 2 counts.

Perhaps Revere has a brass, a copper or some special alloy to help you in the development or improvement of your product . . . in cutting your production costs. So why not tell Revere *your* metal problems? Call the Revere Sales Office nearest you today.

REVERE

COPPER & BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

On the ASSEMBLY LINE

AUTOMOTIVE NEWS AND OPINIONS

Battle for more auto steel still rages . . . Aluminum order stumps prophets . . . New engine tooling is crowded by defense work . . . Chrysler wins lower auto freight rates.

By WALTER G. PATTON

Pull Supply Lines Tighter—The battle for supplies required to build autos at a record-breaking pace is now going into its critical stage. Week by week, supply lines are being pulled tighter while schedules are continuing at a high level. Estimated production last week was 120,000 units.

Preliminary estimates show U. S. car and truck output in U. S. and Canada during November may hit 625,000. Despite a 100-day strike during 1950, Chrysler has already passed its 11 month production of last year. The industry as a whole is running about 37 pct ahead of a year ago.

Shortages Hit Production—The steel pinch—plus a strike in a key supplier plant—has recently cost Nash and Packard many hundreds of cars. Many workers have been laid off temporarily. Last week Chrysler was forced to lay off 40,000 employees as Dodge, DeSoto, Chrysler and Dodge plants ran out of steel.

With new restrictions on aluminum, copper and nickel just around the corner, the industry's best forecasters frankly admit they are stumped in their efforts to predict the future. Chevrolet has announced schedules for the first quarter exceeding the 1950 rate. There is, however, little confidence such schedules can be maintained.

Less Output, Less Scrap—Production cutbacks in Detroit auto plants have resulted in a corresponding loss in the amount of scrap generated. In Detroit the scramble for scrap not already earmarked to go back to steel mills is terrific. Free scrap in dealers' hands is bringing substantial premiums. A few months ago—and traditionally—yard scrap was being discounted. Today, the same scrap which is free to move where it is most needed is bringing a premium of at least $7.50 per ton.

Model Facelifting Mostly—1949 model runs are just about at an end. The independents have already introduced their new models. Chrysler has just issued the last release against 1949 parts. Several GM divisions have already started production on their 1951 models. Most of the changes are of the facelifting variety. At the same time, it should be recognized that even limited alterations mean that many millions of dollars have to be spent for new tooling.

Want New Engines—As this is written, many of the new high compression engine programs are hanging in the balance. Car manufacturers have not changed their minds about wanting new engines. The decision has been made by Ford, Lincoln, Mercury, Buick, Dodge, DeSoto (and possibly Plymouth) to go ahead with new powerplants.

Today's $64 question is whether these programs will eventually have to be shelved in favor of defense work. Some tooling orders are already being pushed back by defense work carrying a priority. The number of machine tool orders in this category is growing. Several machine tool firms are actually *soliciting* priorities from their customers in order to help them get necessary raw materials.

Aluminum to Cast Iron—In the excitement about a possible aluminum shortage, reports were thick in Detroit last week about conversion from aluminum to cast

iron pistons. Buick was reported as doing the job in 10 days. This report, it is claimed, is premature. Most probably Buick—and other car manufacturers—are carefully investigating what will have to be done about both materials and tooling if a change is necessary. The job can hardly be accomplished in 10 days or even 20 days, however.

Engineers have told THE IRON AGE that a retooling job for pistons can hardly be accomplished in less than 6 to 8 weeks. This may account for some of the excitement here during the past week. There is no doubt that many auto producers are carefully weighing the moves they will make to meet materials shortages—both Washington-made and otherwise. Thus far, however, there have been relatively few switches in materials specifications.

Lower Freight Rates—An 11-year struggle by Chrysler and several independent producers to obtain more favorable freight rates has been decided in favor of Chrysler. Last week an Interstate Commerce Commission order was issued to reduce freight rates on new automobiles an average of 12 pct.

For years Chrysler and independent car manufacturers who do not have branch assembly plants have claimed discrimination by the railroads in favor of General Motors and Ford. The railroads have been directed by ICC to make upward adjustments in rates out of the assembly plant cities and downward adjustments out of home-factory cities. In some areas, the saving may be $10 a car. Unless an anticipated appeal by the railroads results in a postponement, the order will become effective Feb. 20.

New Chrysler Engine—It may be expected that when its new V-8 high compression engine is introduced in January, Chrysler will claim many advantages over its competition. Pilot production of the new engine is going forward at the Jefferson plant. The most prominent departure in the new Chrysler design will be in the high compression head.

Reports indicate the new engine will have the spark plugs located in the center. This design requires a special rocker arm. The new engine has been reported to give up to 30 pct more mileage.

Ford Holds Priceline—While labor and materials costs have been rising and independent auto producers have usually increased the price tags on their 1951 models, Ford is still holding the priceline. Its 1951 passenger cars will be introduced at no increase in list prices. Through the installation of new facilities and equipment and by increased efficiency in operations, the company has been able, up to the present time, to absorb rising costs.

"How long we can find ways and means to meet increasing costs, and for how long price increases can be resisted depend on many things beyond the company's control," said L. D. Crusoe, Ford vice-president.

Report Smooth Driving—The new Fordomatic Drive will be available at $159.30, Detroit. During the past week members of the Detroit press section were permitted to drive new Ford cars equipped with these transmissions. Those who have driven the cars find that, in addition to the advantages of automatic driving available in other transmissions, Ford has added some other desirable features.

Smooth starts (using the equivalent of a second gear) and effective down hill braking are two of these advantages. The cars can be easily rocked. Several years of test driving has indicated that the air cooling system employed is effective under very severe traffic conditions and during hill climbing.

THE BULL OF THE WOODS — By J. R. Williams

YES, I TOLD YOU TO CUT ONE FLANGE OFF THESE OLD TRACK WHEELS, BUT YOU'RE CUTTIN' OFF TH' WRONG ONE--TH' DRAWING SHOWS IT OFF THIS OTHER SIDE, YOU-- YOU--
WAIT, I'LL GET THE CRANE AN' TURN IT AROUND IN TH' LATHE, AN' THEN IT'LL BE ON THIS SIDE, YOU-YOU--
HE GOT TO BE A BOSS BY PULL, AN' HE'S BEEN PULLIN' ON IT EVER SINCE-- SOME AWFUL ONES!
12-1
"JOHNNY JUMP-UP"
J.R.WILLIAMS

skilled springmakers..
AND practical,
experienced engineers,
SPECIALISTS
in spring design
and manufacture
at Accurate

It takes people to make springs. Ours are specialized, highly trained, long-experienced people—well qualified to give you the finest in spring craftsmanship.

Our engineers too, are an important reason why you'll like Accurate Spring Service. They're old hands at spring-making... they've developed manufacturing systems and procedures that enable us to handle your jobs with the greatest speed and efficiency. These Accurate engineers are at your service on spring design problems. You will benefit from their practical assistance in designing exactly the right spring for your application.

Why not try Accurate on your next job.

ACCURATE SPRING MFG. CO.
3819 W. Lake Street Chicago 24, Illinois

Ask for your free copy of the new revised Accurate Handbook of Technical Data on Springs. This booklet has been out of print for some time and if you have previously asked for a copy and have not received it, we would appreciate your asking again.

Accurate Springs

SPRINGS WIREFORMS • STAMPINGS

WEST COAST PROGRESS REPORT

Digest of Far West Industrial Activity—By R. T. REINHARDT

Nonferrous Confusion — Manufacturers using aluminum have been working like mad ever since they were warned that starting Dec. 1 they would be under restricted allocations.

Strangely enough, there are some aluminum fabricators who have been under the misconception that not only were their supplies to be reduced, but that primary producers likewise were to be curtailed. On the contrary, all producers in the Pacific Northwest are working at capacity or above rated capacity to supply both civilian customers and DO.

New Kaiser Capacity—Kaiser Aluminum & Chemical Corp. is pushing construction at Mead of its new seventh pot line of 140 cells which will increase production by approximately 3 million lbs a month early next spring. This will give Mead an annual capacity of about 290 million lbs. In addition the plant at Tacoma, Wash., is producing at a newly increased rate of 50 million lbs a year.

Plead Hardship Cases—In anticipation of the reduced allocation of aluminum, many fabricators are already asking field offices of the Dept. of Commerce to have exceptions made, many contending that they require a minimum of 85 pct of their use during the established base period to break even. The smaller the fabricator the more acute the situation apparently is.

Another group of businesses hard hit by the restrictions are those concerns who established aluminum fabricating plants since June 30th, when the 6 months' base period ended, and hence have no historical use on which to base future allotments.

Reynolds Makes Peace—Labor difficulties at the Reynolds Metal Co. plant in the Pacific Northwest were settled last week when the United Steelworkers reached an agreement in Portland involving all the company's plants in the U. S.

Work stoppages had occurred on three different occasions when negotiations didn't move as fast as the employees thought they should. The union won an agreement that back wages on the flat 10 pct increase previously agreed on will be paid from Oct. 1. No contractual changes were allowed by the union. Wage negotiations can be reopened April 1951.

Labor Stability—The nonferrous metals industry appears to be all set for a welcome period of employee stability, insofar as wage agreements are concerned.

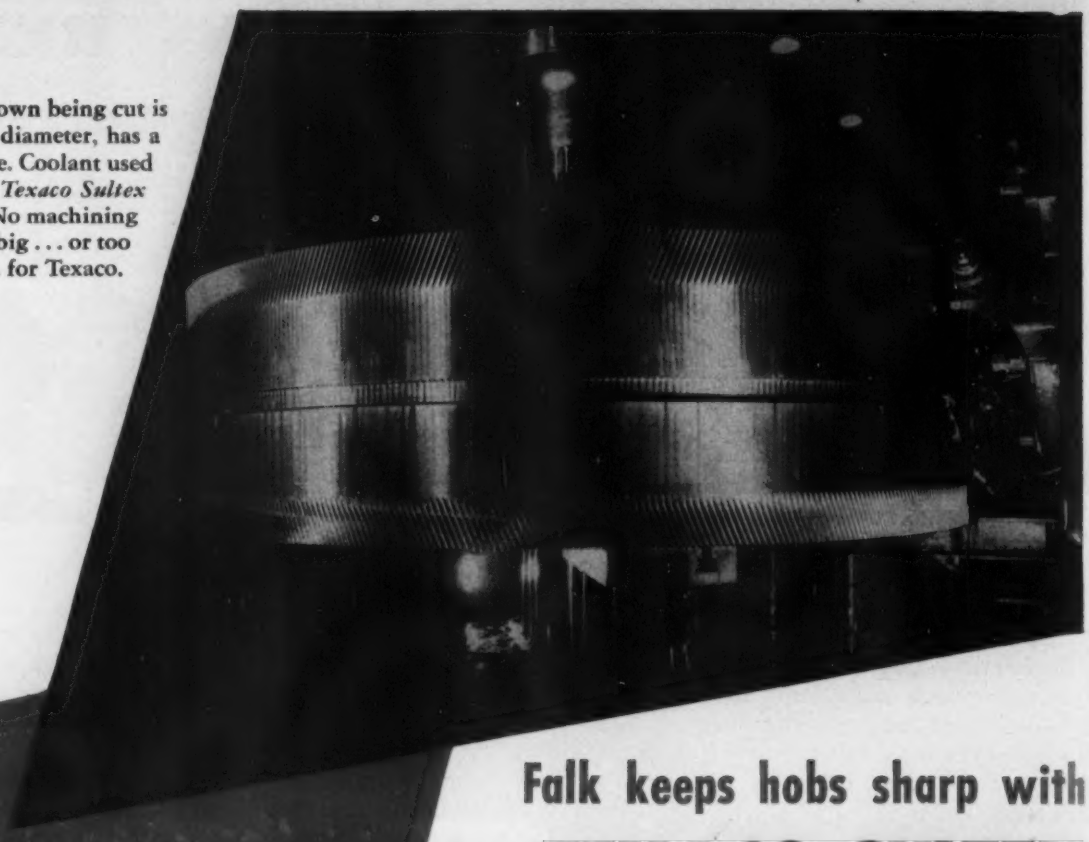
Virtually all companies in the Utah area have now granted a 10¢ per hr wage increase to supplement a 5¢ increase and various other benefits granted last July and August. The last round of wage increases was agreed upon with a minimum of argument and negotiating.

USA Plugs for Marginal Mines —United Steelworkers of America, which now represents most of the nonferrous metal mine employees in the Utah-Nevada area, is taking an active part in keeping Washington, D. C., conscious of the needs of marginal properties. A delegation of union officials recently returned from conferences with the National Security Resources Board and reported that they were given assurances that marginal mines would be well taken care of in the mine aid program.

Foundry Smog Licked?—Gray-iron foundrymen in Los Angeles County are taking heart in the performance of a recently installed custom - built anti-smog unit at the Apex Steel Corp., Ltd., in Los Angeles.

Since 1948 a group of 42 gray-iron foundries has spent approximately $80,000 in cooperative research in an effort to develop or purchase equipment which would meet the stringent regulations of the Los Angeles County Air Pollution Control District. A number of commercial units designed to clean up the stack emissions have been tried without success.

The apparatus under test involves washing, filtering and reheating cupola emissions.



Falk gear shown being cut is 15 feet in diameter, has a 42-inch gear face. Coolant used on hobs is *Texaco Sultex Cutting Oil*. No machining job is too big . . . or too small . . . for Texaco.

ACCURACY to .0001"

Falk keeps hobs sharp with TEXACO SULTEX CUTTING OIL

Picture shows first cut — about a 5-day job — on a giant Falk double helical reduction gear. On finish cut — a non-stop, 72-hour operation — *the two hobs must not change dimensions 1/10,000 of an inch!* If they do, the big gear will have to be recut. Hobs *must* stay sharp.

Texaco Sultex Cutting Oil is used here . . . and on hundreds of other difficult machining jobs . . . because of the effective way it lubricates the hob . . . keeps tool and work cool . . . prevents chip welding . . . assures better surface finish.

Texaco Sultex Cutting Oil is but one of a complete line of Texaco cutting, grinding and soluble oils . . . designed to assure longer tool life and better, faster machining whatever the metal or the method of cutting it.

Let a Texaco Lubrication Engineer, specializing in cutting coolants, help you improve machining efficiency and reduce costs. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon

THE FEDERAL VIEW

THIS WEEK IN WASHINGTON

By EUGENE J. HARDY

V-Loans for Expansion — The V-Loan guarantee program, successful in World War II, probably will be used for plant expansion. During the last war the loans made working capital available to defense contractors and this will again be their major task.

Federal Reserve officials say nothing prohibits guaranteeing agencies standing behind bank loans for facility expansion if such action aids national defense. There is a strong feeling such a course would be less inflationary since it would utilize bank funds rather than the $600 million RFC funds available for plant expansion.

Prefers Method—National Security Resources Board Chairman W. Stuart Symington hopes needed industrial expansion can be financed in this manner. He points out that one loan application already received would more than take up the $600 million in Federal funds.

The Army, Navy and Air Force will probably limit guarantees to instances tied in with production schedules. Guarantees for facility expansion are more likely to come from the Dept. of Commerce, Interior, Agricultural or General Services Administration.

Steel Write-Offs — Applications for "certificates of necessity," entitling the holder to a 5-year write-off, covering more than half of the 9.4 million ton steel expansion program are being analyzed by National Production Authority.

The National Security Resources Board this week issued its first "necessity certificate" to the Jones & Laughlin Steel Corp. The new J & L facilities are estimated to cost about $144 million. The proposed expansion is expected to result in the increase of ingot capacity by about 1,200,000 tons, of coke and related by-products by 266,400 tons, and of electrolytic tin plate by 168,000 tons.

NPA officials are concerned because steel applications concentrate on steelmaking facilities, without compensating boosts in blast furnace and coke oven capacity.

Expansion Goal?—This concern might indicate the Federal government will set an overall goal for steel expansion. There are divergent views on need for steel expansion among the Commerce, Interior, and Agriculture Depts.

If decided a goal should be set, NSRB Chairman Symington has indicated he will recommend the figure to President Truman, provided other departments cannot agree.

Requirements Needed — NSRB needs more data on military requirements. Mr. Symington says some requirements are available to NPA, but not complete data. Greater detail, particularly on end-items, is needed.

First quarter requirements for steel total about 800,000 tons, 35,000 more than estimated needs for the current quarter. Beyond this, no firm requirements are available and NPA says published estimates that 18.5 to 19 million tons will be needed by the military during the fourth quarter of 1951, are ridiculous.

Product Limitations — Mr. Symington disagrees with the NPA method of ordering cuts in use of critical materials, as ordered for aluminum and cobalt, and allowing the remainder to be used for any product, regardless of essentiality. This could portend end-product limitation orders—a course NPA has been trying to avoid.

WOCS—No more dollar-a-year men, but WOCS (without compensation) are o.k. President Truman still nursing his phobia about industry officials serving government, has ordered mobilization agencies may hire men from industry to serve without pay but only in "advisory or consultative positions." The President begrudgingly weakened.

Exceptions will be where the individual possesses experience not available on a full-time salaried basis. A WOC may not participate in government transactions involving his firms, from making claims, or appearing for others regarding such claims, against the government involving matters under his jurisdiction for a period of 2 years.

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IRON AGE
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FEATURE ARTICLES

Sigma Phase In Stainless

WHAT
WHEN
AND WHY

Part I

By GEORGE V. SMITH
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U. S. Steel Corp.
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Sigma phase has been a thoroughly confused subject which the ASTM Sigma Symposium at Atlantic City in July did not clear up. Part I of this two-part article clarifies many of the misunderstandings, although not all of the mysteries of sigma, including its effect on properties, are fully understood as yet.

FOR a number of years after its discovery in 1927 by Bain and Griffiths, there was comparatively little interest in the sigma phase of iron-chromium and iron-chromium-nickel alloys. Some investigators were unable to detect this phase, a consequence, we now know, of the relative sluggishness of its formation under certain conditions. Furthermore, the metallography of the stainless steels did not until comparatively recently receive the attention it deserved. Today, as a result of the important commercial position of the stainless steels, and as attested by the recent ASTM symposium, considerable interest has developed in sigma and its effects upon material properties. At the same time, there appears to be some confusion or uncertainty regarding its occurrence and identification, its mode of formation, whether more than one kind of sigma exists and finally whether its presence is desirable or undesirable.

Sigma is a hard, brittle, nonmagnetic phase based on the compound FeCr of the binary iron-chromium system, Fig. 1.[1] There is some solubility for either iron or chromium and the single phase field ranges from about 42 to about 48 weight per cent chromium. Although the single phase field is relatively restricted, the two-phase field, alpha (ferrite) plus sigma, ranges on the iron side to about 25 pct chromium. Thus, the commercial 27 Cr steel (AISI type 446) may exhibit sigma. Recent work by J. J. Heger, however, who developed sigma in the commercial 17 pct chromium alloy (AISI type 430) by a combination of prior cold work and prolonged heat-

ing, indicates that Fig. 1 needs to be revised to show sigma at lower chromium content.

The problem of the crystal structure of sigma has defied a complete solution, owing to the complexity of the lattice and the extreme difficulty of producing it in the required form of a single crystal. The X-ray diffraction pattern of sigma, however, though complex, is characteristic and permits positive identification. This pattern, Fig. 2, shows many lines indicating the structure to be relatively complex.

Recent X-ray diffraction studies,[2] the first to produce a minute single crystal of sigma, gave Laue patterns which showed tetragonal symmetry and thus proved the crystal structure to be tetragonal. Unfortunately the crystal was accidentally destroyed before "rotation" diffraction patterns could be obtained and accordingly the unit cell dimensions were not obtained.

Constitution Diagrams Are Hazy

Sigma is observed in many ternary or multicomponent alloys. But whereas a number of these systems are under investigation owing to their commercial importance or to their possible importance in the field of the so-called "superalloys," the constitution diagrams, with the exception of the Fe-Cr-Ni system, are not well-known. Since the Fe-Cr-Ni system forms the base for the commercially important austenitic stainless steels, it has been extensively studied. Fig. 3 shows an isothermal section of this ternary diagram. It may be noted that many of the chromium-nickel stainless steels lie within or near phase fields wherein sigma is stable. Also, the commercial alloys contain small amounts of other elements which may be expected to modify the phase boundaries of Fig. 3. The constitution diagram shows that sigma may form directly from either ferrite (alpha) or austenite (gamma), a question about which there has been much unnecessary confusion.

Effect of Various Elements

The effect of various elements on the amount and rate of formation of sigma and on its temperature range of stability is a very complex matter. Most important, perhaps, sigma may form from either ferrite or austenite, but at notably different rates. The effect of any specific element depends to a marked extent on whether the addition has changed the alloy from a completely austenitic material to a duplex austenitic-ferritic structure. Furthermore, different elements exhibit different affinities for the carbon and nitrogen always present, and thus may indirectly affect the composition of the alloy. Thus the carbide in one alloy may be Cr_4C, in another CbC, with appropriate changes in the composition of the austenite or ferrite phases. Finally, commercial alloys are never completely homogenous, so that any one nominal alloy has small regions of other alloy content, each with its own tendency to form sigma. Thus castings or weld metal are generally considered to be more prone to form sigma than the corresponding wrought alloy, a consequence of these segregations. Moreover, castings and weld metal are often made to slightly different chemical composition for one reason or another. For example, austenitic weld metal is often designed to contain a small amount of ferrite to minimize cracking tendencies; sigma precipitates more readily from this ferrite than from austenite.

Sigma Occurs Frequently

Bearing in mind these complicating factors, it is worth while to consider briefly the reported effects of various elements, notwithstanding that in many cases the experimental details are insufficiently known. Before doing this it should be noted that sigma has been observed in nearly all of the commercial austenitic stainless steels except the plain 18Cr-8Ni (if fully austenitic) and the high nickel 15Cr-35Ni types. In addition, sigma has been observed in a few of the so-called super alloys and doubtless will be found in others as they receive more thorough metallographic attention.

In regard to the effect of individual elements in the chromium-nickel-iron stainless steels, that of nickel may be seen in the ternary section of Fig. 3; the first additions of this element widen the range of compositions in which sigma occurs, but large amounts yield alloys free of sigma (cf. the 15Cr-35Ni alloy). The maximum temperature of stability of sigma is raised by nickel to about 1740°F.

Some Elements Increase Sigma

Increasing the carbon diminishes the tendency to sigma formation, perhaps by tying up the chromium as carbide, and is employed for this purpose in castings. Reasoning suggests that nitrogen should behave similarly, but it has been claimed otherwise.[4] The ternary iron-chromium-manganese system has been studied by Burgess and Forgeng, who observed that the effect of manganese on formation of sigma is similar to that of nickel; manganese, however, is somewhat more soluble in sigma than is nickel.

The so-called ferrite forming elements appear to enhance the precipitation of sigma, both in respect to widening the range of composition in which it may occur, and also in accelerating the rate of precipitation. Included amongst these are silicon, molybdenum, columbium, titanium, zirconium and aluminum. It seems probable that in a number of these instances the enhancement of sigma precipitation is partly, or perhaps solely, a consequence of a change to a dupiex austenite-ferrite structure, or if this already exists, to greater quantities of ferrite.

In the chromium-nickel steels containing molybdenum, not only sigma but another phase may apparently occur in addition to the usual carbides. Andrews[5] has recently reported a body-centered cubic structure ($a_o = 8.860$ KX), similar to that of alpha manganese, in residues from such steels whose exact composition, however, was not specified. In the discussion at the 1950

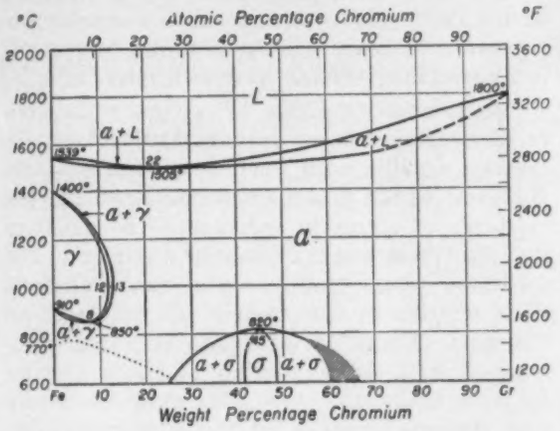


FIG. 1—The iron-chromium constitution diagram. Bain and Aborn[2].

The results of these investigations have shown that in general sigma forms much more slowly from austenite than it does from the delta ferrite in duplex ferritic-austenitic steels of similar chemical composition. The delta ferrite is, of course, richer in chromium than the austenite. Whereas in the latter steels, sigma may develop during usual heat treatment operations,[6] it may require prolonged exposure at elevated temperatures to develop this phase in completely austenitic steels. In some of the binary iron-chromium and related alloys, which are completely ferritic, the precipitation of sigma is apparently as sluggish in some instances as in the austenitic steels, while in others sigma readily precipitates.

When sigma develops from ferrite in duplex steels a characteristic aggregate structure, sometimes appearing lamellar, is observed during the early stages of the reaction, Fig. 5. Although this has puzzled some investigators, the explanation appears to be simply that sigma nuclei develop and grow simultaneously at a number of sites within the ferrite particle. Moreover, since the chromium content of the sigma phase is doubtless much greater than that of the ferrite, the depletion of this element from the immediately

FIG. 2—Characteristic X-ray diffraction pattern of sigma in 55 Fe-45 Cr alloy; Chromium radiation. Alloy converted entirely to sigma during 20 hr at 1350°F following cold work. Dulis and Smith[3].

ASTM symposium on sigma, this was occasionally referred to as "X" constituent. It should not be confused with sigma.

The microscopic appearance of sigma in a number of wrought commercial austenitic stainless steels is shown in Fig. 4. Sigma is not differentiated from carbide (no ferrite is present) in the photomicrographs; however, the relatively massive particles are sigma, whereas the smaller particles are mainly carbide.

Mode of Formation Is Controversial

One of the most controversial questions regarding sigma has concerned whether it can form directly from austenite. No one has questioned that it may form from ferrite, for sigma is based on the FeCr phase of the binary iron-chromium system, in which it can form only from ferrite. It would seem that in a similar way the ternary iron-chromium-nickel diagram, Fig. 3, offers sufficient proof that sigma may also form directly from austenite. For all but a few investigators, doubt that sigma may form directly from austenite has now been dispelled by a number of studies wherein no phases other than sigma, austenite and carbide were observed during the formation of sigma in steels which were initially wholly austenitic.

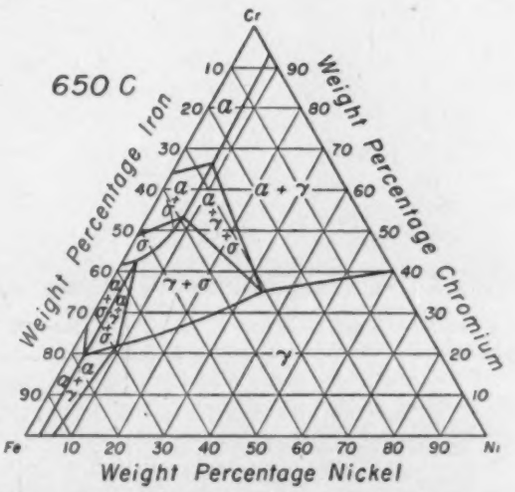


FIG. 3—The iron-chromium-nickel constitution diagram—Isothermal section at 650°C. Bain and Aborn. ASM Metal Handbook, 1948.

surrounding matrix probably alters the composition of this region sufficiently to cause formation of austenite, giving rise to alternate regions of sigma and austenite. Thus at an intermediate stage of the reaction, a structure comprised of ferrite, sigma, austenite and carbide (this latter as a consequence of the reduced solubility of this phase at the exposure temperature compared to

the annealing temperature) is observed.

During the recent ASTM symposium on sigma, there was some discussion on whether sigma might be nucleated by carbide, i.e., sigma precipitates and grows upon a particle of carbide already precipitated. The reasons for suggesting such a mechanism are not clear, and logic suggests skepticism inasmuch as the precipitation of chromium carbide must deplete the surrounding matrix in the very element, chromium, which is required in high concentration in sigma; nor would one expect chromium carbide, a very stable phase, to break down, once precipitated.

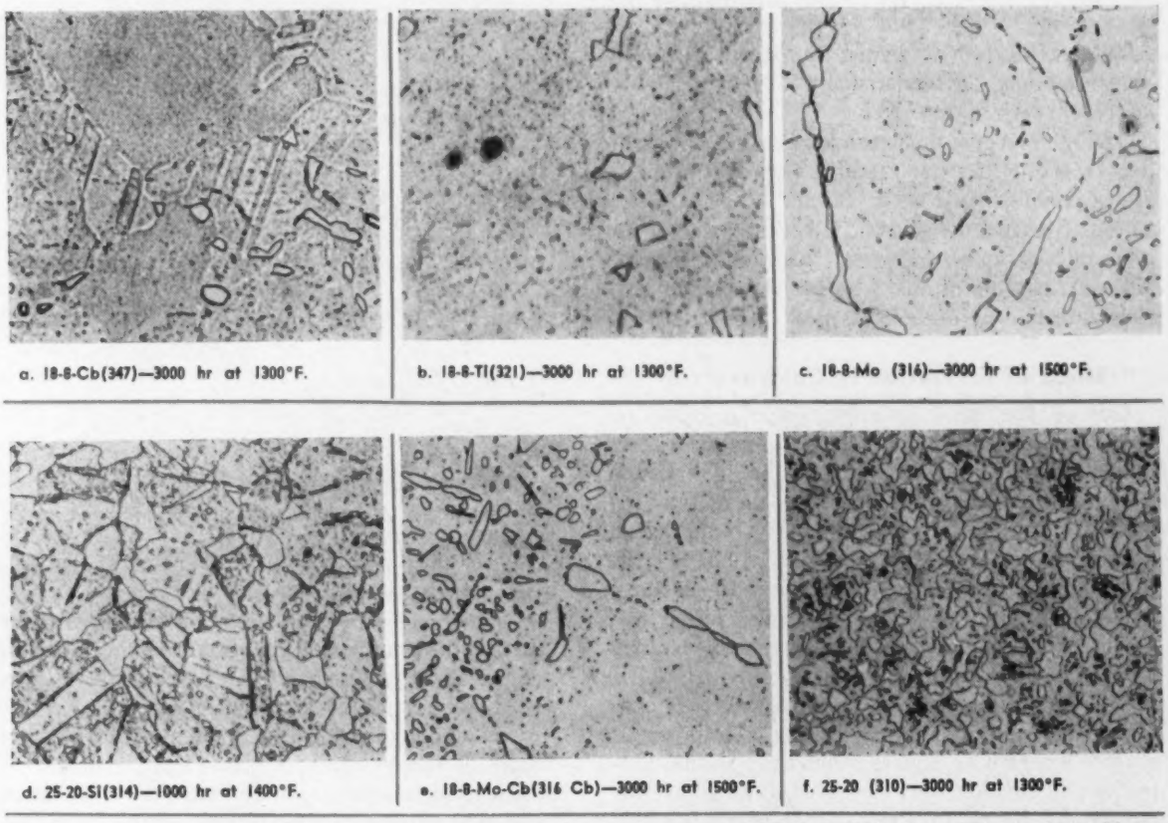
When sigma has precipitated in a steel which in the annealed state is wholly austenitic, the sigma may be again dissolved in the austenite by re-annealing. Ferrite may appear transiently during such re-solution, a consequence of a non-equilibrium state which may be described as the resultant of two processes that proceed simultaneously. The first of these involves the solution of chromium-rich sigma at the interface between sigma and austenite; this can only proceed as fast as chromium diffuses away from the interface. Simultaneously a second process proceeds, namely, the transformation of chromium-rich sigma to ferrite which, for that particular composition, is a stable phase. The first process is slow relative to the second and ferrite appears as a transient phase until the continued diffusion of chromium into the surrounding austenite makes the ferrite unstable so that it transforms.

While it is not yet possible to discuss in any detail the question of the rate of formation of sigma, it is clear that this can vary within wide limits, depending upon composition, prior history and temperature. It precipitates relatively rapidly from delta ferrite in duplex alloys, for example, during cooling after solution heat treatment; or thousands of hours may be required to precipitate sigma in completely austenitic alloys.

Precipitation of sigma is extremely sluggish at temperatures below perhaps 1100°F, but increases rapidly with increasing temperature. However, as the maximum temperature for the existence of sigma is approached the quantity that may form and the rate may diminish to the vanishing point. This maximum temperature is itself affected by composition and makes it all the more difficult to generalize on rates. Emmanuel,[7] in a thorough study of sigma precipitation in 25Cr-20Ni (type 310) steel, has shown that rate of formation of this phase increases with temperature up to about 1500°F, then decreases to the vanishing point of 1700°F.

Prior Treatment Is Important

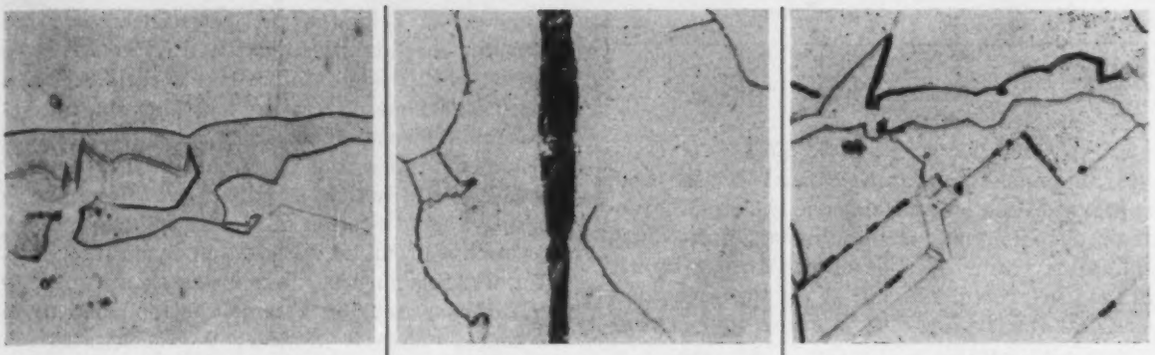
Prior treatment appears to affect markedly the rate of precipitation of sigma, but as yet, only scattered observations have been reported. For example, the precipitation of sigma can be slowed by a grain-coarsening treatment. On the other



a. 18-8-Cb(347)—3000 hr at 1300°F. b. 18-8-Ti(321)—3000 hr at 1300°F. c. 18-8-Mo (316)—3000 hr at 1500°F.

d. 25-20-Si(314)—1000 hr at 1400°F. e. 18-8-Mo-Cb(316 Cb)—3000 hr at 1500°F. f. 25-20 (310)—3000 hr at 1300°F.

FIG. 4—Microstructure of several austenitic stainless steels after treatments indicated. Etched in solution of hydrochloric and picric acids in alcohol[5]. 850X.

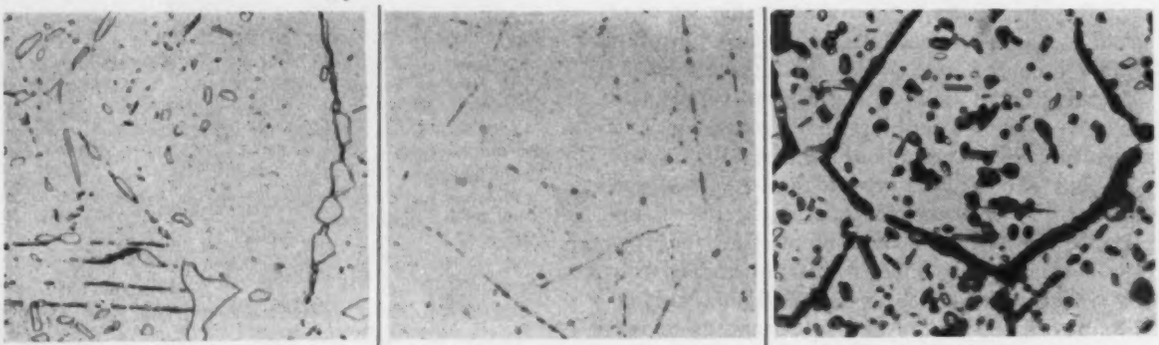


a. As quenched from 2000°F; delta ferrite stringer in austenite; magnetic permeability; $\mu = 1.0747$.

b. As in a and reheated at 1300°F for 3000 hr; stringer is now ferrite, sigma, carbide and austenite; $\mu = 1.0389$.

c. As in a and reheated at 1500°F for 3000 hr. Massive sigma stringer in austenite; $\mu = 1.0040$.

FIG. 5—Precipitation of sigma in delta ferrite of 18Cr-8Ni-Mo (0.03C) steel. Etched in solution of nitric and hydrofluoric acids in glycerine.[3] 850X.



a. Hydrochloric and picric acids in alcohol.

b. Alkaline ferricyanide at room temperature for 1 min; staining carbide only.

c. Chromic acid electrolytically — 3 v, 1 amp, 15 sec., carbide and sigma attacked.

FIG. 6—Actions of indicated etchants upon 18Cr-8Ni-Mo (316) steel containing austenite, carbide and sigma.[3] 850X.

hand, the accelerating action of cold plastic deformation, and to a lesser extent of hot deformation, upon the precipitation of sigma is well-known.

Considerable confusion and uncertainty has arisen regarding the microscopic identification of sigma. This appears to be attributable principally to the essential similarity in etching characteristics of carbide and sigma. No difficulty arises in differentiating these phases from austenite or ferrite except when the particle size is irresolvably small, and then, as in many cases, it is uncertain whether the observed etching effect is a consequence of attack on the particle or on the boundary between particle and matrix. In any event, since ferrite is the only ferromagnetic constituent among these, a supplemental measurement of magnetic permeability will reveal the presence or absence of ferrite. The oxide scale is ferromagnetic and if present must be removed.

Most of the etchants that have been used for stainless steels may be divided into three rather broad categories: acid reagents and alkaline ferricyanide reagents, which are of the immersion type, and electrolytic etchants. Although there are exceptions, most of the acid etchants (picric and hydrochloric acids in alcohol is one of the most popular) attack austenite more rapidly than other phases and thus leave these other phases in relief.

With a few exceptions, the electrolytic etchants attack carbide and sigma vigorously and austenite relatively slowly. This is generally sufficient to identify, by difference, the ferrite phase. With the electrolytic etchants, the carbide is attacked more rapidly in some instances, whereas in other instances the sigma is more readily attacked, the specific effect depending upon the alloy and the etchant; thus, while the relative rate of electrolytic attack may permit differentiation of sigma and carbide in any specific alloy, it does not provide a general differentiation.

Identification of Sigma Difficult

For differentiating between carbide and sigma, most investigators have resorted to alkaline ferricyanide etchants, which are of several concentrations and are used either at room temperature or at boiling temperature; it is with these that most of the contradictory observations have been reported. These etchants are of the staining type, causing a film to cover the attacked particles. To rely on such effects is at best unsatisfactory, for the color of the stain depends to some extent upon the exact concentration of the etchant, and the time and temperature of etching. Thus one must view with some caution differentiations based on difference in color; in many cases a gamut of colors may be observed on one large particle or for the same phase at different parts of the etched specimen. However, with some exceptions in re-

spect to small particles and to 25Cr-20Ni (type 310), alkaline ferricyanide etchant if used cold, appears to stain only carbide and thus to differentiate it from sigma; in these instances, however, sigma may sometimes be observed very faintly in the background matrix. When this etchant is used at the boiling temperature it generally stains both carbide and sigma. The actions of acid, alkaline ferricyanide and electrolytic etchants on 18Cr-8Ni-Mo steel (type 316) containing austenite, carbide and sigma are illustrated in Fig. 6.

Unfortunately as yet no universal etchant or set of etchants has been found which will differentiate among these phases, and in unfamiliar structures or alloys it is desirable to supplement the microscopic examination by other methods which may include magnetic permeability, hardness, but above all X-ray diffraction. Magnetic permeability measurements are, of course, applicable only when ferrite is present and then they provide a very effective means for following the transformation of ferrite to sigma. Advantage may also be taken of the magnetism of ferrite in a microscopic examination; if a colloidal suspension of iron particles is applied to the polished surface of a sample under the influence of a magnetic field, the particles collect over the ferrite phase and thus identify it. Sigma is quite hard, perhaps some 750 DPH, but carbide is also hard, and generally rather small, so that microhardness measurements are not a satisfactory means of differentiation of those two phases.

X-ray diffraction is capable of providing a positive identification of sigma, or other phases, as well. Chromium X-radiation is most satisfactory for this purpose. In many cases, the quantity of sigma present in a sample is too small to be detected unless it is somehow concentrated. In any event, X-ray diffraction permits positive proof of the occurrence of sigma, but does not reveal how much is present in the alloy.

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NBS Checks Operating Temperatures of Jet Engines

EFFICIENT operation and adequate protection of the power plant in jet engines requires very rapid reduction in the temperature of the gas stream whenever this temperature exceeds a limiting safe value. The rates of response of whatever temperature-sensing devices are used thus assume considerable importance in jet-engine operation.

Recently A. I. Dahl and E. F. Fiock of the National Bureau of Standards have developed apparatus which determines the rate of response of jet-engine temperature elements under conditions very closely approximating those obtaining in the combustion stream. With this equipment, response times as short as 0.02 sec. have been measured for a wide variety of thermocouples, resistance thermometers, and thermistors.

This apparatus consists essentially of a jet-engine combustor, or burner, with provision for mounting instruments in the exhaust gas stream, and a device for producing rapid changes in the temperature of the mounted test instrument. A compressor or blower supplies air to a single Jumo 004 turbo-jet engine combustor equipped with its normal fuel injector and spark plug. Exhaust gases from the combustor pass through two 90° turns, through a perforated plate, and then through about 10 ft of straight pipe before reaching the test section, which has three convenience hatches for mounting instruments. In this way, the gas stream is kept at essentially uniform temperature and velocity over the central half diameter of the test section, and exposure of any instrument to direct radiation from the flame is prevented by the turns in the duct system.

Two systems of this kind are now in operation at the Bureau. Air for one is supplied by a blower with a capacity of 4,000 cu ft of free air a minute, and air for the other is provided by centrifugal compressors having a combined capacity of 10,000 cu ft per min. The systems have identical Inconel test sections, about 6 in. in diam. The second system can be operated at temperatures up to about 2,000°F, and at mass flow rates up to 15 lb per sec ft^2 in the 6-in test section. A test section 3 in. in diam is used in endurance tests and in research where velocities up to 1,800 ft per sec are of interest.

[1] For further details, see "Response Characteristics of Temperature-sensing Elements for Use in the Control of Jet Engines," by Andrew I. Dahl and Ernest F. Fiock, J. Research NBS 45 (1950) RP2136.

Wet Tumbling

LOWERS DEBURRING COSTS

By ROBERT H. ANDERSON
Foreman, Tumbling Dept.,
Bendix Products Div.,
Bendix Aviation Corp.,
South Bend, Ind.

Over a million zinc, aluminum, magnesium and steel parts are deburred and burnished at Bendix Aviation's South Bend plant each week. Parts from 1 oz to 15 lb are wet tumbled in Roto-Finish barrels. Cost is less, and uniformity is higher than with hand burring.

SEVERAL hundred different parts totaling more than a million a week are processed through the tumbling department of the Bendix Products Div., Bendix Aviation Corp., South Bend, Ind. Tumbling is done both to remove burrs and to ball burnish surfaces, the latter commonly as a preliminary to plating.

Parts processed include castings in zinc, aluminum and magnesium alloys and a great many in wrought steel and some other wrought metals, Fig. 1. In this group are parts weighing from less than 1 oz to as much as 15 lb. Their dimensions range from a fraction of an inch to as much as 24 in. The parts go ultimately into carburetors, brakes, aircraft components or other Bendix products.

Rubber Linings Are Preferred

In the department are ten large Roto-Finish barrels, of up to 56-in. diam, Fig. 2, and two smaller open-end barrels. The latter are of the tilting type. All are for wet tumbling. Some barrels still have wooden linings. However, synthetic rubber linings are preferred and will soon be used on all barrels. All barrels have individual motor drives. There are two overhead trolley cranes for handling heavy loads, Fig. 3. The department also has equipment for rapid sorting and storing of stone chips, for separating chips from parts processed, and a washing machine.

For burring, the major abrasive is granite chips in seven different sizes. The size chosen is usually that capable of fastest cutting, large enough to avoid lodging in holes or recesses of the parts and yet small enough to reach all edges to be burred. In addition to the chips, Roto-Finish compounds are used for nearly all burring and burnishing operations. In the latter, steel balls are employed rather than limestone chips. The number or type of compound is chosen both for the kind of metal parts processed and for the character of work being done.

In addition to the choice of chip size and compound type, the chief remaining variable is

tumbling time. This time is varied more or less in relation to the hardness of the metal, the initial condition of the parts, and the specification to be met. The duration of the tumbling operation depends upon how much edges must be rounded or, in burnishing, how "high" a finish is required. Softer metals, including zinc, aluminum and magnesium, always require less time than steel for the same initial conditions and final results.

FIG. 2—Operator shovels parts into one of the Roto-Finish barrels. Bins for storing different sizes of abrasive granite chips are at right.

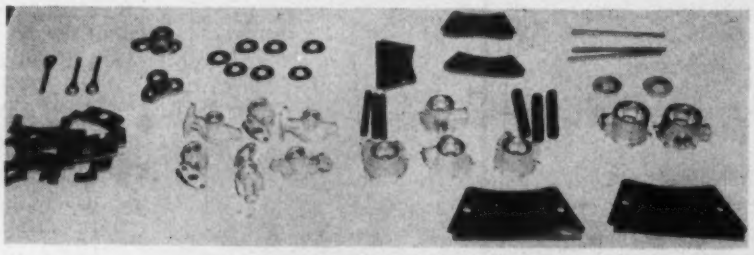


FIG. 1—These parts are beburred at Bendix by Roto-Finishing. Parts of darker color (photo at the right) are steel. Substantial savings over hand burring are realized.

FIG. 3—An overhead trolley hoist, lower right, facilitates charging one compartment of the two in a typical Roto-Finish barrel.

In this plant, it is not the practice to follow a precise formula for each design of part. This is largely because batches of any given part are received in different conditions. If burrs are moderately heavy because tools have become dull, burring time is increased. If burrs are excessively heavy, hand burring may be necessary or may be more economical than very long tumbling. Excessively heavy burrs may merely be bent over and not removed even in long tumbling. In this case hand burring is essential. This, however, is not common. Usually the department foreman decides how long a tumbling period is needed to meet the specification imposed.

In general, zinc, aluminum or magnesium parts are burred adequately in 20 min to 2 hr. For steel, burring time ranges, as a rule, from 1 to 12 hr. For small steel parts being burred in a No. 45, two-compartment barrel, a typical charge is about 400 lb of parts, an equal weight of granite chips, and 2 lb of No. 11 Roto-Finish compound per compartment. In this barrel, compartments are 19½ in. long and 32 in. in diam. The size of chip is chosen to suit the part. Sometimes mixed sizes work best, but generally the size is as small as will cut rapidly and not stick in holes or recesses.

Among large parts burred are hardened steel plates up to 24 in. long. In this case, only 30 pieces are done at a time in two-compartment 27x32-in. barrels. Such a load weighs about 200 lb. For this, 600 lb of No. 3 chips and 2½ lb No. 11 compound are employed. Time ranges from 6 to 12 hr. In all cases of burring, enough water to cover the solid charge, chips included, is applied.

Barrel speed ranges from 12 to 21 rpm, being slowest on barrels of largest diameter. Where barrels have variable speed motors, they are run at the maximum speed attainable unless this results in damage to parts.

In deburring aluminum and zinc castings, a typical charge includes 400 lb of parts, 400 lb of No. 4 chips, and 2½ lb of what Bendix calls its No. 1 compound. This charge is handled in a 27x32-in. barrel turning at 21 rpm and is completed in a 20-min run.

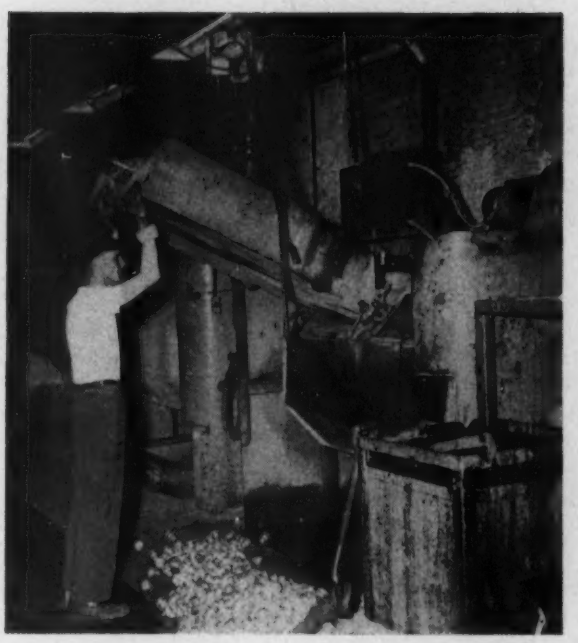


FIG. 4—Granite chips dumped into a hopper are elevated into the shaker, left foreground, where they are separated on screens of different mesh size.

After barrels are charged, covers locked, and rotation started, attention is seldom needed until tumbling is completed. However, with magnesium parts considerable gas is generated. In this case, if long tumbling is needed, the barrel is usually stopped after about 3 hr to relieve the pressure built up. Among magnesium parts deburred here are $\frac{3}{8}$-in thick shim plates tumbled 30 per barrel, as well as some magnesium spiders. Both types of parts are for aircraft applications.

Some aluminum shims receive two tumblings, one for 6 hr after initial machining and again for 2 hr after being removed, pierced and straightened. Following the second tumbling operation, further straightening is done where necessary. Where burrs are not adequately removed by tumbling, some hand burring is required.

Compound Alone Can Be Used

On occasional steel parts, compound alone has been found to give better results than chips and compound used together. This unusual method saves chip handling and allows the tumbling of more parts per barrel.

After tumbling is completed, compartment covers are removed and contents, including parts and chips, are flushed out with water to remove compound. Barrels are then dumped onto screens that rest on tote pans. This separates parts from chips. If chips and parts are too nearly the same size for screen separation and the parts are steel, they are often picked up from the chip pile by a portable electromagnet. Screening is used for nonmagnetic parts whenever it works well. But if chips and parts are too nearly of a size, some hand separation may be needed.

Chips left in tote pans after parts are removed are hosed off and then are shifted to a hopper, Fig. 4. Here an elevator feeds them onto a separator equipped with shaker screens of seven sizes. Largest chips remaining on the top screen and others on screens of successively smaller mesh and are run off these screens into bins for chips of the same size. Fines broken from chips feed through the lowest screen and are discarded. Compounds used keep chips from glazing and thus losing their cutting power.

Burnishing Requires Other Compounds

Parts to be burnished rather than burred or to be burnished after burring, are handled in the same set of barrels that do burring. However, a different compound is employed and steel balls are used rather than chips. Ball sizes are such that they will burnish the smallest radius on the piece.

Some parts are handled three times through burnishing operations: Once after being burred; once after cyanide hardening; and finally to bring up a luster after the parts have received a hard chromium plate. In such operations, 150 lb of the steel parts are run with 800 lb of steel balls and 1 lb of No. 300 Roto-Compound.

After the final barrel operation, and sometimes between such operations if parts are to stand long enough to rust or discolor, they are put through the washing machine, Fig. 5. The washer uses hot soluble oil for all parts except aluminum, and hot water for aluminum.

Roto-Finishing is not a cure-all and does not eliminate hand burring on some parts. However, for a large range of parts, the labor and cost saving over hand burring is large. Also, a greater degree of uniformity is attained. Burnishing costs much less than polishing and buffing by wheel and provides a sufficient luster on many parts to be plated. It also serves to burnish plated finishes that are not adequately bright as produced.

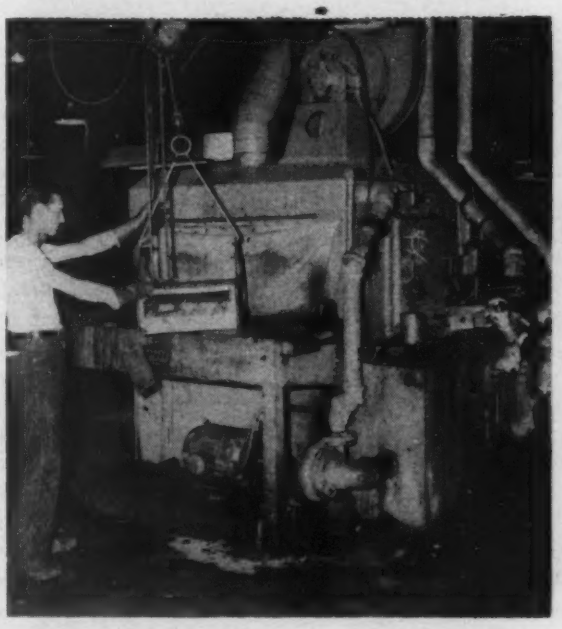


FIG. 5—The basket of deburred parts being transferred into a washing machine will be cleaned and coated with hot soluble oil.

ARVIDA MILL

IS FULLY AUTOMATIC AND REPEATING

By H. JONES
Engineer, Industrial Div.,
Dominion Engineering Co., Ltd.,
Montreal

Aluminum Co. of Canada's new Belgium rod mill combines the advantages of the free looping mill with those of the continuous mill, at low initial investment. Automatic and simple operation enabled green crews to produce at higher than rated capacity in less thas 6 months.

THE Arvida rod mill, located in the Saguenay Valley of the Province of Quebec, is the first rolling mill in this district. The crew were all drawn from this district and none, including the rollers, had had previous rolling mill experience. The management of Alcan required that the new mill be fully automatic and repeating. The desired objective was accomplished by Dominion Engineering Co., Ltd., Montreal, assisted by their American counterpart, United Engineering & Foundry Co., Pittsburgh.

The tonnage involved, as well as the disadvantages of hot rolling aluminum under slight tension, did not warrant a continuous or semicontinuous mill. The solution of the problem led to the development of the fully automatic Belgium mill which combined the advantages of the free looping mill with many of the advantages of the continuous mill at a low initial investment. Automatic roughing mill manipulators and square repeaters were in common use at that time so that it was necessary to develop efficient oval repeaters and to integrate all three into one design.

Rolling from a 6x6x36 in., 125-lb ingot down to ⅜-in. rod in 22 passes, the mill is designed to produce 100,000 lb of aluminum per 8-hr shift. This production is equivalent to 18 tons of steel or 20 tons of copper per hr. About 90 pct of production is ⅜-in. diam. soft aluminum conductor rod, most of which is later cold drawn for electrical transmission cables; the remaining 10 pct is alloys and odd sizes.

In keeping with the modern company city of Arvida, the brick mill building is air-conditioned, fluorescent lighted and of the latest design, equipped with a 25-ton aluminum alloy 110-ft span crane. The two electric heating furnaces are located in a separate building. These furnaces are 44 ft long with two sets of chains each and can handle either two rows of 6x6x36 in. ingots or one row of 4x4x72 in. ingots. Circulating

fans and accurate controls insure uniformly zoned temperatures throughout.

The roughing mill is driven by a 900 hp, 720 rpm induction motor through a 9000-hp second flywheel drive with 9.85:1 ratio and a 21x28 in. 3-high pinion stand. Two 22x64 in. 3-high stands with five passes each and one 22x54 in. 3-high stand with three passes form the roughing mill train. Dominion UX rolls are provided with appropriate spare grooves. Roll adjustment is by top roll screwdown and bottom roll screwup. Ryertex bearings and wobbler type spindles are used. Rest bars are of the apron type with dovetail guide mountings. All guide equipment is roller equipped to prevent pick up.

Bearings Differ

The five intermediate mills are driven by a 900 hp, 212 rpm synchronous motor through a 12x26 in. 3-high pinion stand while the four finishing mills are driven by a 900 hp, 360 rpm synchronous motor through a 14x16 in. 3-high pinion stand. The intermediate and finishing mills are 3-high 11 in.—15½x24 in. stands with Dominion special chill rolls. The finisher and last intermediate stands are roller bearing equipped while the remaining stands have Ryertex bearings.

Wobbler type spindles are used with through spindles replacing dummy rolls and again apron type rest bars and roller equipped guides. Special bronze entry guides are equipped with laminated shim spacers that provide adjustments as fine as 0.001 in. in the guide openings. Special bronze delivery guides will release and throw out if packing or pick up occurs from improper setting. Double stranding starts at the first intermediate mill.

Process Continuous Cast Ingots

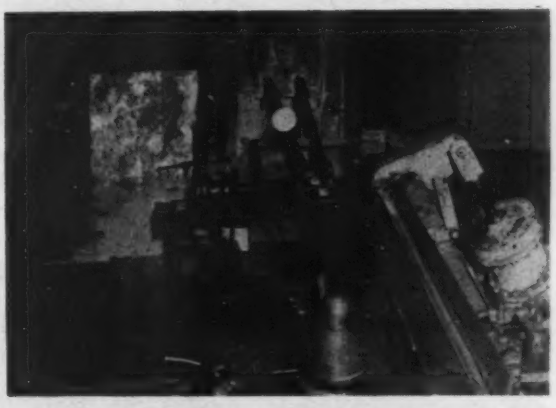
Continuous cast ingots are cut to length, fed into the back of the two continuous furnaces, heated to about 700°F and carried into the mill building on a 100-ft approach table by means of a transfer and short table. The 4x4 in. ingots may be fed directly into No. 5 pass. The automatic roughing mill manipulators are operated by air cylinders through solenoid valves and flag limit switches. The operation is progressive so that each flag initiates the next operation and returns the previous one.

Ingots leaving a top pass strike a flag to tilt the delivery table and dump the billet into the next entry trough, where another flag starts the air cylinder to push the billet back into the mill. Where the bar becomes too long and slender, such as at No. 11 pass, the bar is dumped between overrunning vertical pinch rolls, set close to the mill, to feed the bar in. Bars leaving a bottom pass similarly cause the delivery trough to be raised and rotated to the entry position for the next pass, where they are again pushed into the mill.

Between stands, motor-driven chain transfers

GENERAL VIEW of mill showing entry side lift manipulators with transfers and horseshoe repeater. First all-aluminum crane is in background.

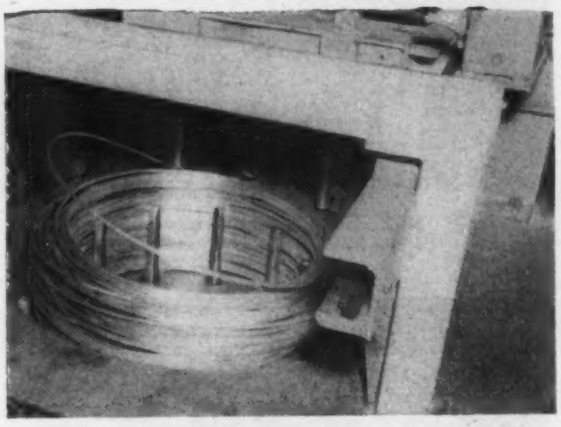
DELIVERY SIDE dump manipulators, showing transfer from No. 1 to No. 2 stand and oval running out of No. 13 pass.



HEAD END SHEAR, vertical pinch roll and selector switch feeding No. 14 pass.

OVAL TURNERS and open troughs are shown in this view. The deflector plates may be seen at the left.

SELECTOR SWITCHES between finishing stand and reels. Photo above was taken before final pass repeater was installed, so hand sticking the final pass does not show the mill as fully automatic. This was changed after run-in.



STRIPPING the finished coil at Alcan's new Belgium rod mill, located at Arvida, Quebec.

STRANDING steel reinforced aluminum cable at the Shawinigan Works of Aluminum Co. of Canada, Ltd.

automatically carry the bar over to the next stand. An air alligator shear may be selected at No. 10 pass to automatically shear the head end before transferring. The 1⅜ in. diam round out of No. 12 pass is repeated up to No. 13 pass in the same stand by means of a horseshoe repeater. All manipulators are roller-equipped to prevent pick up and scratching.

The bar running out of the last roughing mill pass trips No. 2 air-operated alligator shear to crop the head end of the bar and then dump it into vertical pinch rolls feeding the first intermediate mill. A selector switch between the pinch roll and the mill is operated from the shear to switch successive bars to alternate grooves for double stranding. Six inches is cropped off the tail end on the fly by an automatic snap shear located about 50 ft from the mill to remove the troublesome fishtail. The shear is initiated by a tail and detector for minimum cropping.

Repeaters Allow 85° Twist

As aluminum heats up during rolling, the conventional cast iron square down-repeaters are set 10 ft from the mill to provide space for cooling the rod. This also cuts down the angle of climb in the repeater and provides a smoother runout for the light aluminum loop. Oval turners placed immediately behind the delivery guides on the oval side are set at about 20°. The oval up-repeaters welded from structural steel are placed 12 ft from the mill to allow the oval room to continue the twist to 85° at the entrance to the repeater.

Canted angles serve as open troughs between the turners and repeaters to allow the oval to jump close to the turner before the bar gets on edge so that the oval jumps up and out of the trough rather than back in again. Rollers and a flattened tube on edge hold the oval up on delivery from the repeater. Vertical and horizontal rollers are strategically placed to prevent scratching and pickup. The last oval repeater is provided with small feeder pinch rolls mounted on overrunning clutches to insure good entry into the tight fitting entry finishing guides.

No Danger of Cobbles

Where double stranding occurs, on the oval side, roller equipped strand separators are used to keep the rods from touching as they run down the looping pit as one loop would pull the other rod across with it causing cobbles. This is not necessary on the run-in side. The same feature is used on the square side as a precautionary measure against scratching, although it was not indicated as necessary.

Four pin reels are used, two for each strand. Once the stripping operation is initiated, the remaining operations again follow progressively. Stripping on the reel automatically switches the next rod to the alternate reel. The platen con-

veyer is automatically advanced 12 ft each time No. 3 or No. 4 reel is stripped, thus spacing all coils 6 ft apart.

Soluble oil is used as a roll coolant and to prevent pick up on the rolls. An adequate circulating system is provided with screens, filters and pumps. The same soluble oil is also used as a coolant and lubricant on the Ryertex bearings.

After starting up with completely green crews who were looking at the first rolling mill they had ever seen, both shifts were over rated capacity in less than 6 months. Considering that the theoretical limit of running two continuous prime rods though the last stand is 153,000 lb and that this mill must roll to conductivity and tensile tolerances as well as gage, this is no small achievement.

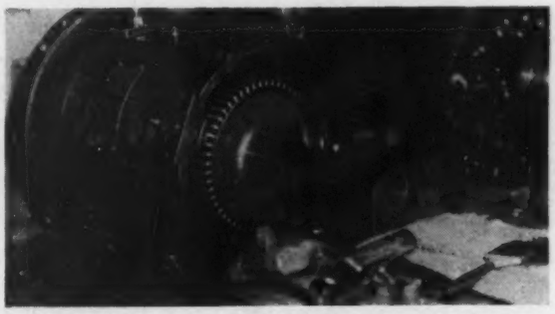
It is expected that increased interest will be shown in the automatic Belgium mill which maintains the advantages of and overcomes the main disadvantages of the old Belgium mill. The number of operating men required is now no more than on a continuous mill and can be said to be determined by the number required for roll changes. The delivery speed is no longer limited to the ability of a man to stick the lead oval so that the next logical step is towards higher speed mills with resulting higher production. With metals that pull in when hot rolled under the light tensions of continuous mills, a much better end to end gage is obtained by the free looping automatic Belgium mill. Not the least consideration is the low initial investment per ton of finished rod.

Grinder Used for Lapping Gear Bores

ALTHOUGH grinders are not designed for lapping operations, the new Clark Equipment Co. plant at Jackson, Mich., has applied one such machine for a salvage lapping operation on the splined hole of transmission gears.

Holes of this type are commonly within required limits at the end of the broaching operation that produces the splines, but if they are undersize then or close in a significant amount as a result of heat treating, the gear may have to be scrapped unless resizing by lapping can bring the undersize dimensions within the limits set.

To do the lapping, stub shaft having a male spline is fastened in a holder on the table of the grinding machine as shown in the accompanying illustration. A brush is used to coat the lap with a fine abrasive mixed in oil after which the carriage is set to reciprocate while the gear remains fixed in the chuck of the machine. By reciprocating the lap, some metal is removed, especially at undersize points, and the splined hole is brought within gage limits.



A Heald machine is used because it has a convenient and precise method of locating the gear axially from the pitch circle of the gear teeth with the hole precisely centered and at right angles to the gear face. Also, the carriage provides the rapid and automatic reciprocation of the hone necessary for an expeditious lapping job. As a result of this setup, gears that would have to be scrapped, unless lapped by some other means that probably would be slower or less precise, are saved at minimum cost.

New Books

"International Tin Study Group Statistical Year Book, 1949," shows both the general development of all aspects of the world tin industry and the detailed position—so far as details are available—of each country. It includes information on mine and smelter production, imports and exports, tin concentrates and tin-containing goods, consumption, and production and trade of the tinplate and canning industries. International Tin Study Group, 7 Carel van Bylandtlaan, The Hague, Netherlands. $4.20. 232 p.

"ASTM Specifications for Steel Piping Materials." This latest compilation of steel piping material standards includes some 50 widely used specifications. Covered are: Pipe used to convey liquids, vapors and gases at normal and elevated temperatures; still tubes for refinery service; heat exchanger and condenser tubes, and boiler and superheater tubes. Specifications are also contained on castings, forgings, bolts and nuts used in pipe and related installations. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $3.00. 328 p.

New Notes on High-Strength Heat-Treated Steel

Part II.

By **G. SACHS**, Vice-President, Horizons, Inc., **G. S. SANGDAHL**, President, Metals Research Associates, Inc., and **W. F. BROWN, JR.**, Lewis Flight Propulsion Laboratory, National Advisory Committee for Aeronautics, Cleveland.

Notch test properties respond sensitively to chemical and structural differences in steels possessing higher strength levels. Slack quenched steels may show reduced notch test properties, even if their hardness, tensile strength and elongation appear to be those of fully hardened and tempered material.

PARTS made from different heats of the same steel composition, differing only within commercial chemistry limits when heat treated to identical hardness or strength, may perform in a widely varying manner in service. Such parts may also possess somewhat different impact characteristics. However, no definite information is available regarding the reasons for these variations.

The present investigation sheds some new light on this problem. Among the steels tested were three pairs of different types of alloy steels. The two steels of each pair differed only slightly in their chemical compositions, and were within the limits of a particular SAE steel composition. The manganese steels were an exception; one possessed a considerably higher manganese content than the other.

In Part I, last week's issue, the authors discussed general strength characteristics of heat-treated steels, relations between notch test characteristics, hardness and tensile strength, and effects of steel chemistry.—Ed.

The differences in carbon and manganese contents of the other alloy compositions are also insignificant. The two heats of each type, however, contained varying quantities of aluminum, resulting from the different steelmaking practices. The differences in chemistry between the two heats of each alloy were sufficient to result in different hardenabilities. The heats produced on a commercial basis possessed a lower hardenability than the other heats of each pair. These latter heats were made on a small, experimental scale in a high frequency furnace. The experimental heats possessed a nearly identical hardenability.

The notch strength, notch ductility, and impact energy of each of the experimental heats, fully hardened by brine or caustic quenching, are shown in Fig. 5. The three experimental heats possessed notch strength characteristics that differed in much the same manner from each other as those of the commercial steels.

A comparison of the properties of the experimental heats with those of the commercial heats in Fig. 6, however, reveals that the commercial heat of each steel type generally possessed notch strength characteristics considerably superior to those of the experimental heats. This applied equally to the results of the notch bar tensile tests and to those of the impact tests.

The differences between each commercial steel and its experimental partner were nearly

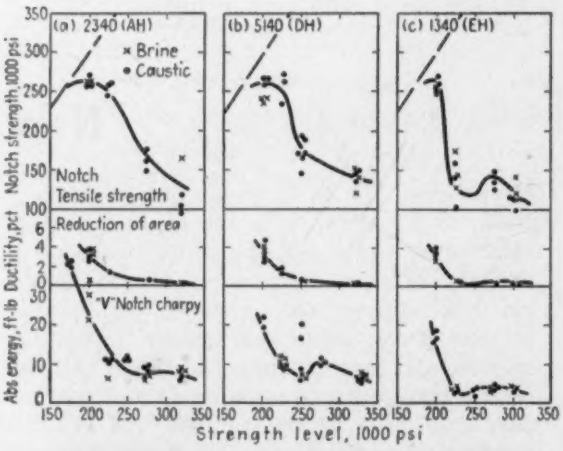


FIG. 5—Notch strength, notch ductility and impact energy of each of the experimental heats, 0.30-in. diam specimens fully hardened by brine or caustic quenching.

constant above 450 Bhn or 225,000 psi. However, if the tensile strength or hardness of any of the steels became less than this critical value, the superiority of the commercial over the experimental heats appeared to fade out gradually. Conversely, no definite effect of steelmaking methods was observed on the conventional tensile test properties of the steels.

The most significant difference in composition between the steels of different manufacture was the aluminum content. The commercial steels contained approximately 0.03 pct Al, while the experimental heats contained less than 0.005 pct. Considering the great effect of deoxidizing with aluminum on the notch strength characteristics of low carbon steels, it appears possible that the complex phenomena associated with the presence and absence of the aluminum treatment are important factors in respect to the notch strength characteristics of heat-treated steels.

Whether the differences in steelmaking and deoxidation practices actually explain the differences in the properties of the commercial and experimental heats cannot be decided without additional systematic investigations in this

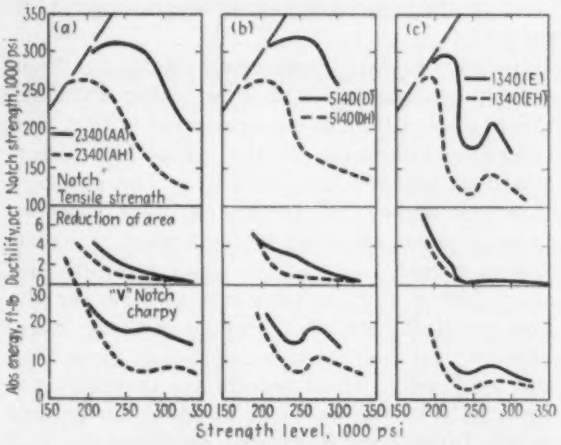


FIG. 6—Comparison of the notch properties of brine and caustic quenched 0.30-in. diam specimens of the experimental and commercial heats.

direction. The cleanliness of all steels was found to be practically the same.

Numerous additional variables are encountered in the casting and processing of heat treated, low alloy steels. Each of these may or may not contribute to the variations in properties of a particular alloy type.

One such factor which is known to affect steel quality is the amount of reduction from the ingot to the tested bar size.[8] This reduction was much greater for the large commercial heats than for the small experimental heats. Furthermore, the test data for the experimental heats scattered considerably, occasionally yielding values considerably higher than the average values of these steels, as shown in Fig. 5b.

To evaluate the effect of an additional homogenizing treatment, a few specimens were soaked at various temperatures for different time intervals, before final heat treatment. The results of these tests in Fig. 7, while not conclusive, indicate that the properties could be improved by a special homogenizing treatment within certain limits of temperature and time.

The notch strength characteristics and ductility of heat-treated steels also depend upon their austenitic grain size.[9, 10] In general, the impact energy is lower for a larger grain size, for any given steel composition. The grain size differences between the two heats of a particular alloy steel varied considerably for the three types. The nickel steels differed only slightly in grain size, but considerably in notch strength characteristics.

Grain Size Unimportant

On the other hand, the manganese steels possessed greatly different grain size, but the properties of these were slightly closer together than those of the other two alloy types. Thus, the grain size does not appear a factor which decisively affected the properties of the investigated steels.

An additional factor which is considered to be particularly important for the properties of heat treated steels is their hardenability. The higher the hardenability, the more readily and consistently commercial heat treating of a given section will develop the fully martensitic structure and optimum strength properties. If the hardenability is below or close to the limit required for a particular section size, the heat-treated part may not be fully martensitic, but slack quenched.

Full Hardness Obtained

Deviations from the martensitic structure are known to adversely affect the notch strength characteristics of heat-treated steels to a considerable extent.[5, 11, 12] In this investigation, all steels were quenched in such a manner that they reached their full hardness.

Certain compositions, nevertheless, showed considerable deviations from the fully martensitic structure under certain quenching conditions. These deviations were greater for the steels of lower hardenabilities. Since the hardenabilty of the experimental heats was higher than that of the commercial, the former would be expected to possess superior notch properties—contrary to the facts.

All carbon and low alloy steels, quenched to a fully hardened structure, contain, in addition to the martensite, a small amount of untransformed austenite.[13, 14] The quantity of this austenite can be reduced considerably by a cold treatment. To determine the effect of such a reduction in austenite content, a number of

quenched specimens were subjected to a cold treatment. It consisted of immersing the specimen in liquid nitrogen for 15 min, immediately after quenching. The results of these tests on the commercial alloy steels are illustrated in Fig. 8.

The notch strength and notch ductility were unaffected by the cold treatment, while the impact energy was slightly but consistently reduced.[13] This agrees with the results of some previous tests which also showed a reduction in impact energy and ductility on twisting after refrigeration.[15] However, no definite change could be produced by cold treating in steels other than those in Fig. 8.

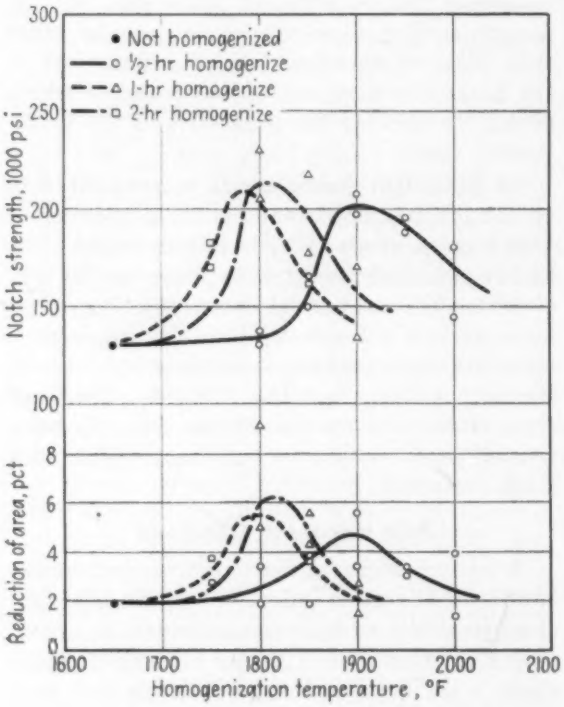


FIG. 7—Effect (above) of homogenizing time and temperature on the notch tensile properties of the experimental 2340 heat of steel. Specimens were brine-quenched and tempered at 475°F (hardness, 49 to 50 Rc).

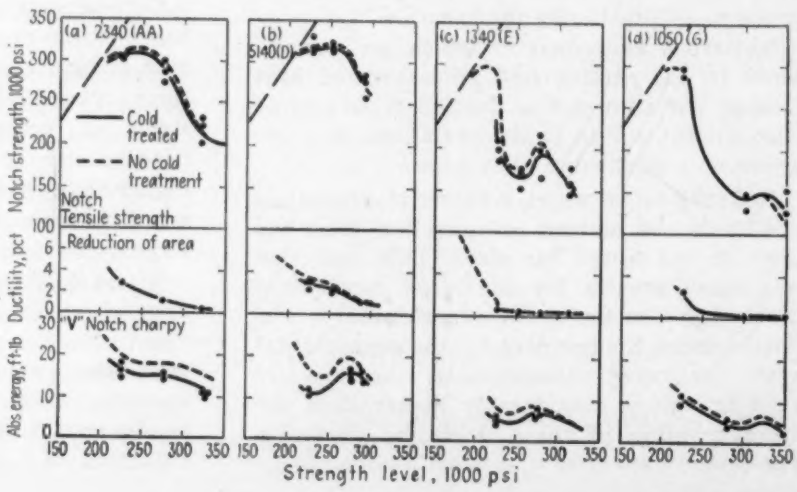


FIG. 8—Effect (right) of cold treatment on brine-quenched 0.30-in. diam specimens of the commercial 2340, 5140, 1340 and 1050 heats. Specimens not given cold treatment are indicated by dashed lines.

These results indicate that the presence of a small amount of austenite in a martensitic matrix has little, or possibly a slight, beneficial effect on the notch strength characteristics of a hardened steel. The decomposition of this austenite is known to occur on tempering at temperatures between 400° and 700°F; it also results in properties which are not materially affected by the differences in the quantities of austenite present in untreated and cold-treated specimens, respectively.

Effects of Slack Quenching

Deviations from the fully martensitic structure are frequently tolerated in commercially hardened steels. The reduction in hardness and strength caused by the presence of intermediate products would not be noticeable, even if the quantity of these products exceeded a few per cent. The slack quenched condition may possess a hardness, tensile strength, and elongation within the scattering range of the fully hardened condition even if as much as 10 pct of its structure was not martensitic.[16] The effects of such a deviation from the fully hardened condition on the hardness and strength will be further reduced after tempering.

On the contrary, such small deviations from a fully martensitic structure, other than retained austenite, may be associated with a considerable reduction of the properties determined on notched test bars.[11, 12]. The presence of a few percent of ferrite or other intermediate products obtained by isothermal transformation greatly reduced the notch strength and notch ductility of low alloy steels.[4] However, the heat treating conditions applied in these investigations differed from conventional quenching and tempering. Their results are therefore not applicable to the problem of slack quenching unless further substantiated by direct tests of this type.

To obtain some preliminary data on this problem, the steels in the present investigation

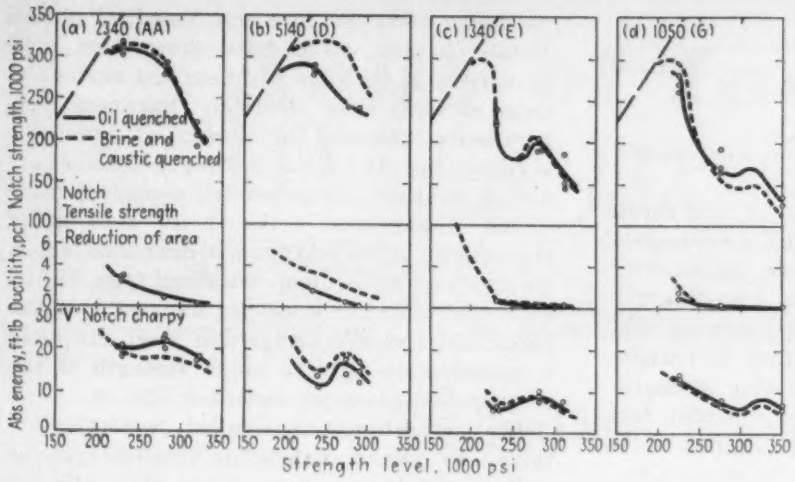
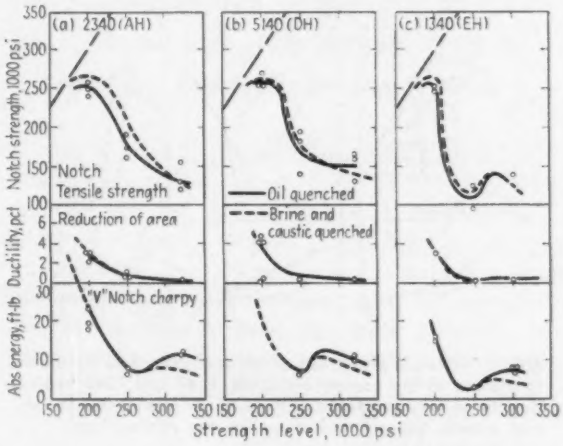


FIG. 9—Notch properties (left) of oil-quenched 0.30-in. diam specimens of the experimental 2340, 5140 and 1340 heats. Results of brine and caustic quenching are shown as dashed lines.

FIG. 10—Notch strength properties (below) of oil-quenched 0.30-in. diam specimens of the experimental 2340, 5140 and 1340 heats. Results of brine and caustic quenching are shown by the dashed lines.



were subjected to oil quenching, in addition to brine and caustic quenching. For most of the steels, oil quenching was limited to specimens of the same shape and size as had been used for brine and caustic quenching. In addition, larger, 0.50-in. diam tensile test specimens of the three commercial alloy steels were subjected to oil quenching. Results of these notch tests are assembled in Figs. 9, 10 and 11.

Base of Notch Structures Vital

Microstructures of the as-hardened specimens were carefully investigated for the presence of intermediate products. Particular attention was paid to the structural conditions at the base of the notch, which presumably determine the properties of the notched specimen.

Generally, wherever a slack quenched condition was present, the amount of intermediate products was slightly larger at the notch root than at the inside of the specimens. This may be explained by the difficulty of maintaining an uninterrupted contact between cooling medium and metal at the sharply contoured notch roots during quenching. As a consequence, the base of the notch is probably quenched indirectly, by conductivity from adjacent sections, rather than by direct contact with the cooling medium.

The brine and caustic quenched specimens of all steels possessed a fully martensitic structure. In the oil quenched condition of the 0.30-in. diam tensile specimens, as well as of 0.40-in. sq impact specimens, the three experimental steels and the commercial nickel steel were also fully martensitic. In contrast, the structures of the oil-quenched specimens in these sizes of the commercial alloy steels other than the nickel steel contained a small amount; that of the carbon steel contained a considerable amount of intermediate transformation products.

Finally, the alloy steels that were oil quenched in the 0.50-in. diam size, with the exception of the nickel steel, exhibited intermediate transformation products. The quantity of the nonmartensitic constituents in these instances was considerably greater than in the smaller specimens.

The notch test characteristics of the fully martensitic steels in the oil quenched specimens were almost identical with those of brine or caustic quenched specimens. However, specimens tempered to the highest hardness values, over 250,000 psi, exhibited distinctly higher impact values when oil quenched than when brine or caustic quenched. This difference may be attributed to the thermal stresses developed during quenching; these should be distinctly higher and produce greater distortions on brine and caustic quenching than on oil quenching.

As shown in Fig. 9, the notch strength, notch ductility and impact energy of the commercial chromium steel were considerably reduced by oil quenching, compared with the values of these properties obtained by brine or caustic quenching. Such an effect of the intermediate transformation products is in agreement with previous results of tests on this steel where the decomposition products were produced by isothermal arrests in the cooling cycle.[5]

The presence of intermediate transformation products had practically no effect on the properties of either the commercial manganese steel or the carbon steel. In fact, the impact strength of these steels at strength levels above 250,000 psi was again higher for the oil

quenched than for the brine or caustic quenched specimens.

The 0.50-in. diam specimens of all three alloy steels, oil quenched, yielded lower notch strength and notch ductility than the smaller specimens. In all three steels investigated, the differences in the properties between the small and the large specimens first increased, according to Fig. 11, with increasing strength level and then remained nearly constant for strength levels of 225,000 psi and higher.

If the reduction in properties from the 0.30-

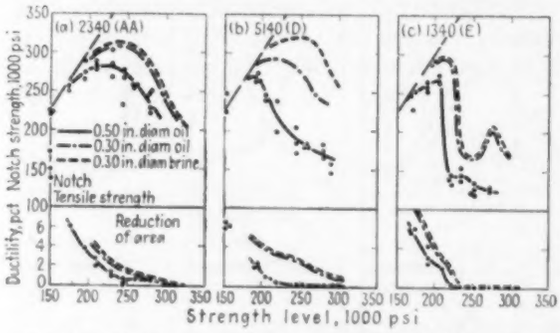


FIG. 11—Notch properties of oil-quenched 0.50-in. diam specimens of the commercial 2340, 5140 and 1340 heats. Results of fully hardened 0.30-in. diam specimens (brine and caustic quench) are shown by the dashed lines.

in. diam, brine or caustic quenched specimens to the larger, oil-quenched specimens is compared for the three steels, the difference in their response to slack quenching is found to be rather striking. The percentage decrease in the properties of the nickel steel was much smaller than that of either the chromium steel or the manganese steel.

The chromium steel suffered quite severely; its notch strength at a strength level of 250,000 psi was reduced by more than 40 pct in the large size, as compared with about 20 pct for the manganese steel and 15 pct for the nickel steel. Thus, the chromium steel has become, in the 0.50-in. oil-quenched condition, very inferior to the nickel steel, and nearly as poor as the manganese steel.

The objection can be raised that the evaluation of these results is somewhat obscured by an effect of the as-tested section size, which in these tests was identical with the as-quenched section size. Therefore, a series of additional tests was performed. In these, specimens possessing a varying cylindrical cross section were quenched in oil or brine and tempered to yield a hardness of 55 Rc, or tensile strength of 275,000 psi.

From these different as-quenched section sizes, notched tensile test bars of the same size, having a 0.30-in. cylindrical diam, were machined from the core and tested. Previous tests[17] on these steels have shown that their properties in the core and near the surface of large sections were identical. Hardness measurements indicated the absence of noticeable segregations. The tests on these specimens confirmed results of the previously discussed tests.

The nickel steel retained its high notch strength up to the maximum section size tested, which was 1.25-in. diam, machined from 1½-in. diam hot rolled bar stock. In contrast, both the chromium and the manganese steel exhibited a considerably reduced notch strength if the as-quenched diameter exceeded 0.30 in.

The conventional mechanical properties obtained by means of regular tensile tests, as well as the hardness, were but little affected by the quenching method, with the exception of those of the commercial chromium steel. The tensile strength and elongation were practically independent of the rate of quenching and specimen size.

Hardness, yield strength and reduction in area were generally found to be slightly lower after oil quenching when tempered at low temperatures, than after brine or caustic quenching. By grinding the larger oil-quenched specimens to better concentricity and slightly smaller section size, the yield strength and reduction in area were slightly improved.

In the commercial chromium steel, the tensile characteristics of the very hard tempers were radically affected by the quenching method. After brine or caustic soda quenching, specimens tempered at all temperatures possessed high strength and ductility. However, those quenched in oil and tempered at temperatures between 300° and 450°F were found to be rather brittle and to possess inferior strength.

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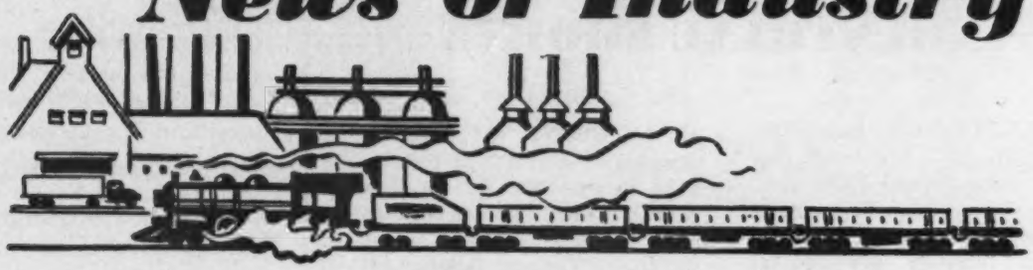
News of Industry



Wage, Price Rise Set

By Tom C. Campbell

New York—The break in the steel wage-price picture was due this week. It was to have been announced Wednesday or Thursday of this week.

United States Steel Corp.—which tried an ill-fated price decrease a few years ago—is not going after its pound of flesh. This firm will absorb a substantial part of the wage costs and accumulated material cost increases.

The increase in wages will be about 12¢ an hr on the base. Since there are many wage classifications built on the base, the average wage increase will be around 16¢ an hr. Fringe concessions will bring the total average wage increase to around 18¢ an hr.

U. S. Steel will raise steel prices about $6 a ton, but they will distribute the hikes so that all products will not be advanced the same amount. This advance does not include that made for tinplate a week ago. The latter was in a class by itself because of a yearly contract setup and because of the increase in the price of tin.

Other steel firms are expected to meet the terms agreed to by U. S. Steel and the United Steelworkers of America. At the same time some of the smaller steel firms which have been hard hit by rising material costs will still charge a premium over prices announced by the larger units.

Red China Halts Tungsten Shipments to U. S.

In 1948 China shipped half U. S. imports . . . Now cuts us off without a ton . . . Korea shut off in bargain . . . Sideswipe to defense . . . Reds hold two-thirds of supply—*By Bill Packard.*

New York—Red China's silent but effective clamp-down on shipments of vital tungsten to the United States dramatizes a supply problem which threatens our defense effort. Overcoming this handicap from domestic sources may well test our ingenuity to the core.

China had been our biggest supplier of tungsten. In 1948 she shipped us slightly more than half of our tungsten imports; today she is shipping us none. The same year Korea supplied 17.6 pct; today she is shipping none.

In peacetime tungsten is essential to our economy; but in wartime it is absolutely vital—in larger quantities. It is an important ingredient in the hard, tough steels and in steels requiring high strength at high temperature. Among its applications are machine tools, including carbide cutting tips; carbide-tipped shells; jet aircraft parts; and tungsten wire filaments.

From Trickle to Halt

In 1948 imports of Chinese ore contained 4.9 million lb of tungsten. In 1949 the tungsten content was about 5.1 million lb. But during the first half of this year tungsten content of Chinese imports was only about 0.3 million lb. During the third quarter these imports were reduced to a mere trickle, slipping out of warehouses not yet under Communist control. They have now stopped.

During the first quarter of this year more than 11.5 million gross lb of tungsten ore which had previously been imported from China were withdrawn from bonded warehouses. Part was consumed but most went into the stockpile. This is more Chinese tungsten than had been withdrawn from warehouses for consumption in the entire 2 previous years. No tungsten has been exported from the U. S. since the middle of last year.

Most Sources Remote

It is no wonder that the loss of our chief supplier is causing grave concern in some industrial circles. The tungsten supply problem is more acute when it is recognized that Communist-dominated countries produce roughly two-thirds of world production of the highly strategical metal.

Like manganese, there are large deposits of tungsten in various parts of the free world. But their exploitation would require a lot of money, mining and transportation equipment, and the priceless ingredient of them all—time. Also, most of these sources are remote and would entail lengthy, hard-to-defend supply lines.

Probably our ace in the hole will prove to be our own domestic reserves. Total recoverable reserves of tungsten in the U. S. are estimated at nearly 2 billion lb. Peacetime consumption requires about 7 to 9 million lb per year. A wartime economy would need more than 20 million lb—much more if certain

INDUSTRIAL SHORTS

VALVE DIVISION—H. K. PORTER CO., INC., Pittsburgh, has formed the Jarecki Valve Div., Tulsa, Okla., to handle the manufacture and sale of Jarecki valves formerly produced at Jarecki Mfg. Co., Erie, Pa. The Jarecki company manufactured a complete line of iron and bronze valves and cocks which will now be produced in Porter's Hinderliter Tool Co. plant in Tulsa.

SERVING THE SOUTH — The SOUTH EAST-JOSLYN CO., subsidiary of Joslyn Mfg. & Supply Co., is constructing a building in Birmingham for manufacturing purposes to serve public utility interests in this area. It will be used for distribution and storage of materials at the beginning.

EXTENDS LINE—Johnson Engineering & Sales Corp., Rockford, Ill., manufacturers of air-driven sanding machines, has been purchased by the PORTER-CABLE MACHINE CO., Syracuse, N. Y. All production facilities of the Johnson company are being moved to Syracuse.

CHANGE OF ADDRESS—RECORDAK CORP., subsidiary of Eastman Kodak Co., has moved their executive and sales offices to 444 Madison Ave., New York.

AIRCO DEALER — Air Reduction Co., Inc., has appointed the S. J. SMITH CO., Davenport, Iowa, a dealer of Airco gas and electric arc welding equipment, supplies and accessories. The newly formed Smith company will service Scott County in Iowa and Rock Island County in Illinois.

GROUP LEADERS—Al Hammerschlag, H & H Scrap Iron Co., Wauwatosa, Wis., has been elected president of the WISCONSIN SCRAP IRON DEALERS ASSN. Joe Lans was named vice-president; Robert Miller, secretary; and Hy Schiffman, treasurer.

CHILE OPENS MILL—Chile's first major steel mill at Huachipato, costing $88 million, has been opened. It is predicted that steel may be available for export to other Western Hemisphere countries since the production of the plant will exceed the needs of the country's national economy.

NO. 5—A new plant at 932 Benton St., Aurora, Ill., has been leased by the SIMPSON ELECTRIC CO., Chicago. This makes a total of five factories now turning out panel instruments and test equipment for Simpson, the company reports.

NEW OWNERSHIP — Ralph Robinson, president of Precision Metal Workers, Chicago, Pressed Metal Corp., Chicago, and Milwaukee Stamping Co., Milwaukee, has acquired controlling ownership in YAWMAN & ERBE MFG. CO., Rochester, N. Y. There will be no change in personnel or policies of the company.

ALL TOGETHER—The railroad division and pig iron and coal chemicals division of the sales department of INLAND STEEL CO. have been consolidated in charge of John J. Davis, Jr. L. C. Reed and A. C. Engh will be assistant managers of sales respectively of railroad products and pig iron and chemicals.

EXPANDING — An additional 56,000 sq ft of floor space is being completed at the Azusa, Calif., plant of the AEROJET ENGINEERING CO. This expansion includes a production machine shop and a physical sciences laboratory.

EASTERN OUTLET — Forker Corp., Cleveland, has appointed the SYRACUSE SUPPLY CO., Syracuse, N. Y., to represent the Ohio Tramrail line of cranes, transfer bridges and Tramrail systems in the central New York State area.

military programs now contemplated are pushed. Domestic output during peacetime runs about 3 million lb, but was pushed to a peak of 9.5 million lb during the last war.

Domestic production of tungsten is very sensitive to price. So are imports. We have recently been outbid on some supplies from

Tungsten Imports from China
(Gross Weight, lb. average WO_3 Content About 68 Pct*)

	Imports			Withdrawn from Warehouses	
	Immediate Consumption	Entered Warehouses	Total Imports	For Consumption	For Refining, Export
1948 Quarters					
1st	916,755	249,271	1,166,026	263,908	236,294
2nd	330,628	1,597,019	1,927,647	254,624	160,523
3rd	43,856	554,823	598,679	484,460	25,953
4th	3,496,230	1,997,898	5,494,128	1,173,911	.....
Total, 1948	4,787,469	4,399,011	9,186,480	2,176,903	422,630
1949 Quarters					
1st	5,154,541	841,036	5,995,577	986,681	82,988
2nd	1,796,678	279,845	2,076,523	428,158	.....
3rd	54,833	198,356	253,189	188,034	.....
4th	128,501	1,055,923	1,184,424	13,202	.....
Total, 1949	7,134,553	2,375,160	9,509,713	1,616,075	82,988
1950 Quarters					
1st	151,232	19,711	170,943	11,556,437	.....
2nd	131,373	277,007	408,380	239,306	.....
3rd†	.....	.....	.....	.....	.....

* A short ton unit = 20 lb WO_3; ore containing 1 pct WO_3 contains 1 unit to the ton; one short ton unit = 15.86 lb metallic tungsten.
† Shipments were reduced to a mere trickle.
Source: U. S. Bureau of Mines—Compilation by The Iron Age.

South America and Australia. Some people in industry feel that higher prices would boost both domestic output and imports.

So far no steelmaking operations have been hampered for lack of tungsten. Steel people are getting enough for current use but they don't have enough margin to feel comfortable. Their future supply position is far from secure.

All the output of the principal domestic producers is now going to the government under contracts that expire Dec. 31. This tungsten is going into the strategic stockpile. Although the quantity now in the stockpile is not known, it is thought to be substantial. But none of this can be made available without Congressional approval.

WANTED—Huge Titanium Expansion

Washington wants budding industry to sprout like Jack's beanstalk . . . Industry wary, wants to see firm orders . . . Military demand still unformed—*By D. I. Brown.*

New York—As yet, there are few proven commercial applications for titanium—this year's most-talked-of metal. Yet fabulous plans for expansion of production facilities are rampant. Everybody wants more of the metal but so far most of the tonnage has gone into development and research programs except those tonnages being used by the Atomic Energy Commission.

Proof's in the Orders

The latest talks on titanium were between high government officials and hundreds of industrialists. The services are yelling for expansion. The industry is expanding but not fast enough to suit everybody. Right now the situation is stalemated.

The military can't very well issue orders for the large tonnages they talk about. They haven't finished all the research now underway and they don't have enough funds at present to greatly increase such programs. Washington talks about large future demands for titanium but industry has taken the down-to-earth attitude: "Show us the firm orders and then we'll take care of the rest."

Working in the Red

The big confidential meeting held Nov. 8 and 9 in the Pentagon on increasing the production of titanium accomplished only two things: (1) It officially documented the well-known fact that production should be increased; and (2) showed that the main obstacles are not primarily technological, but simply a matter of the green stuff—millions of it. There are kinks and some uncertainties about present production methods but these will straighten out.

Already, Titanium Metals Corp. (Allegheny-Ludlum and National Lead Co.), Rem-Cru (Remington Arms and Crucible Steel Co.), Kennecott Copper and N. J. Zinc, P. R. Mallory, and Du Pont have invested many millions in production of sponge and the metal. Most of these companies are still carrying these investments on the red side. Actually the correct base price for the metal itself is yet to be determined. The $5 per lb price for sponge, or the $6 per lb for forgings and the $15 per lb for sheets are still just arbitrary numbers which only increased production and time can correct.

Between the military, civilian and atomic energy, the required tonnages of the metal needed in 1951 have been estimated at 5 million lb and for 1952, 9 million lb. This is a far cry from the approximately 120,000 lb produced this year. It takes 1 lb of sponge to make 1 lb of titanium, so that the capacity for sponge must first be increased. This puts the onus first on Du Pont and National Lead, who are the only producers in quantity to date.

Process Proof Pending

The Kennecott Copper-N. J. Zinc project in Canada will not produce titanium metal or sponge initially. This plant merely beneficiates titanium-bearing ores by increasing the titanium dioxide content from about 40 pct to about 75 pct. The byproduct is iron which, if duplexed, can be made into steel. The success of this unit economically and technically may not be proved until late next year as operations were only started early in October. But this process could be an important factor in increasing production by furnishing large quantities of high-grade titanium ore.

Some experts say that sponge is not the only bottleneck. In reducing titanium tetrachloride to the metal in current processes, magnesium is used to make pure titanium and magnesium chloride. A pound of magnesium for every pound of titanium produced is used and magnesium is not in plentiful supply. A semicontinuous reactor for changing the magnesium chloride back to magnesium and chlorine could be cheaply built but as yet such plants for tonnage production do not exist.

POWER NEEDED FOR REDUCING $TiCl_4$ AND $MgCl_2$

POWER	REACTION
1 to 5 kwh*	Titanium tetrachloride + magnesium = titanium + magnesium chloride
10 kwh*	Magnesium chloride = magnesium + chlorine

* Amount of power needed per lb produced.

Can Meet Demand

Chlorine is the third requirement but unless reactors are built, this element could also prove to be a bottleneck for higher titanium production. Additional power, just plain kilowatt hours is the fourth item which will be needed. (See table.)

The metal producers are confident they can meet the demand. The sponge makers are not quite so confident because they are constantly haunted by the knowledge that some day a cheaper, faster method of sponge production is bound to emerge. The metal makers might not hesitate to invest more money immediately but the sponge makers will probably be more than hesitant. The government has the same shakes about sponge making. Since this comes before the huge new tonnages of the metal can be produced, some-

body is going to have to effect a cure or talk awfully fast.

The triple come-on for investors implied at the Pentagon meeting sounds good. They may offer 5-year amortization of new facilities; guaranteed government loans and firm government orders at a favorable price for a specific length of time. This form of subsidy may or may not be needed. Preliminary discussions on this have already taken place.

Fewer Kibitzers Wanted

In the long run, government money could prove a hindrance rather than a help, and there are some operators who much prefer letting industry do its investing. Fewer kibitzers are involved.

The real tonnage needed next year may be overstated. Some of the defense departments now yelling for more metal have not been granted sufficient funds to carry on the ambitious development projects which, if successful, would then take the huge tonnages. Producers of the metal seem confident they can meet most of the real needs that will appear next year with their present and new facilities now being built.

Recent developments of other methods of melting the sponge into metal are discounted for immediate use. The electrolytic process is a long way off and the hydrogen reduction method has yet to prove itself commercially. The cladding of other metals with titanium is being developed and would spread available tonnages but would probably not help in aircraft and airborne military equipment, which may some day involve a lot of titanium.

There is no bottleneck in processing titanium metal from ingot form into rolled products. Allegheny Ludlum and Crucible have ample experience and rolling capacity. Republic Steel and Niles Rolling Mill Co., Niles, Ohio, have also processed the metal. Generally any mill which has rolled stainless can easily roll titanium.

The money needed to expand the industry to meet the vague future demand was not mentioned in the big pow-wow. The best estimates indicate it takes a $1500 investment per ton of titanium produced per year. Using the lowest figure of 5 million lb per year as an adequate capacity means that about $7½ million must be made available.

Higher Alloy Demands

Washington—Steel producers soon must accept DO rated orders for increased amounts of some alloy products with completion of a National Production Authority ruling now in the drafting stage. To come as an amendment to NPA M-1, the order will also raise the present 45-day lead time for mill scheduling of defense orders.

At a meeting of alloy and stainless steel men and NPA officials last week, approval was lent both proposals which will specify products and percentages of production. NPA officials will not reveal these until the order is out.

TV IN INDUSTRY: One-man audience Edward Wilmans, scrap baler operator in the new Pittsburgh plant of the General Motors Fisher Body Div., takes his cue from the television screen. He is standing at control panel which regulates conveyers carting scrap for baling. The screen shows him when a car is loaded and ready for moving.

Wage Board Hangs Out Shingle After Appointing of All Personnel

Washington—The government's 9-man Wage Stabilization Board hung out its "open-for-business" sign this week.

President Truman, acting under the Defense Production Act, has named three industry members, three labor members, and two "public" members to serve under Chairman Cyrus Ching, WSB head.

Industry members are Henry Bradford Arthur, manager of commercial research for Swift & Co.; J. Ward Keener, vice-president of B. F. Goodrich Co., and Reuben B. Robertson, Jr., president of the Champion Paper & Fibre Co.

Labor's representatives are Harry C. Bates, president of the Bricklayers International Union, AFL; Emil Rieve, president of the Textile Workers Union, CIO, and Elmer E. Walter, vice-president of the International Assn. of Machinists.

Public members are John Dunlop, professor of economics at Harvard, and Clark Kerr, professor of economics and director of the Institute of Industrial Relations at the University of California.

Build Giant Rubber Form Press

Mount Gilead, Ohio—A 7000 ton rubber forming press with a 48 in. x 120 in. pad, one of the largest ever designed by Hydraulic Mfg. Co., is being built for Boeing Aircraft. Hydraulically-actuated tables speed loading of die blocks and materials.

$12.4 Billion Arms Spending Reported By Defense Department

Washington—The Defense Dept. has ordered nearly $8.1 billion worth of equipment and supplies in the 4-month period ended Nov. 1. Additional outlays, including military pay and allowances, civilian pay, research and development brought the total to about $12.4 billion.

Of this, $4,357,000,000 went for aircraft and related items. Other expenditures were $755 million for

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ammunition and guided missiles; $159 million, engineer supplies and equipment; $163 million, clothing and equipage; $368 million, electronics and communications; $122 million, petroleum, oils and lubricants; $95 million, ships; $302 million, subsistence; $906 million, tanks and automotive vehicles; $7 million, transportation equipment; $309 million, weapons; $405 million, other equipment and supplies; $144 million, construction.

NSRB Untying Defense Loan Purse Strings

First loans to industry for defense production will be granted in few weeks . . . Congress swells kitty to $2 billion . . . Certifying agencies to make thorough investigation.

Washington—The first direct government loans to business for defense production purposes are due to be granted within the next few weeks.

Government officials indicated this week they would give speedy but careful attention to applications submitted by firms seeking funds from the plant-expansion kitty set up by Congress in September.

Kitty Up to $2 Billion

The total amount borrowed under the program by all borrowers may not exceed $600 million at any one time. But Congress authorized appropriated funds of $1.4 billion, bringing the total lending kitty up to $2 billion.

The loans will be granted only when the applicant is unable to obtain them from private sources—with or without government guarantee—or from other public sources on reasonable terms.

Stimulus to Expansion

All field offices of the "certifying agencies" will accept loan applications and will transmit them to Washington, Stuart Symington, chairman of the National Security Resources Board, said last week. Mr. Symington said an applicant doing business with a "non-certifying agency," such as the Air Force, may place his application with the agency with which he is dealing for transmittal to the proper agency in Washington. The certifying agencies will be held responsible for a "thorough investigation" of each application, the NSRB chief warned.

Funds made available under the new lending program must be used for expansion of capacity, development of technological processes or production of essential materials. "It should be noted that funds will be loaned only if it can be shown that their use will speed production and deliveries or services to aid in carrying out government contracts for defense," Mr. Symington said.

The 12-page application forms are now available at field offices the "certifying agencies" and the NSRB's Business Expansion Office, 1725 F St., N. W., Washington, D. C.

Carnegie Furnace Out of Blast

Pittsburgh — Edgar Thomson No. 1 blast furnace of Carnegie-Illinois Steel Corp. was blown out on Nov. 17 for relining.

"Just a small raise, boss—to tide me over till I catch you in a happier mood."

Carnegie-Illinois to Rebuild No. 3 Blast Furnace at Duquesne

Pittsburgh—Plans for rebuilding and modernization of No. 3 blast furnace at the Duquesne Works of Carnegie-Illinois Steel Corp. include installation of a new turbo-blower to replace three obsolete steam engines. Increased output is expected to result from more efficient operation.

The new turbo-blower will deliver 90,000 cu ft of air per minute to the hot blast stoves, using 50 pct less steam than the old steam engines. An electrostatic precipitator for cleaning of gases also will be installed.

Built in 1896, the furnace has produced some 6 million tons of iron.

Russia Enters Auto Market

London—Russia is trying to undersell its competing countries in the European auto market. Its entry is the 7-hp Moskvitch. With body lines suspiciously similar to the German Opel, the car sells at Brussels for $123 less than any French or British cars. Already 130 Moskvitchs are on Belgian roads with another 800 on order. The Red car has a top speed of 65 mph.

Use Record Number of Engines

Washington—More new locomotives were put in service in the first 10 months of 1950 by Class 1 railroads than in any corresponding period in the past 27 years, according to the Assn. of American Railroads. Nine steam engines, 8 electric and 1915 diesels were placed in use. As of Nov. 1, railroads had 1523 new locomotives on order, of which 1496 were diesels, 19 steam and 8 electric.

ISIS Chapter Reelects Cline

Washington—Louis B. Cline, of Cline & Bernheim, Nashville, Tenn., was re-elected president of the Southeastern chapter of the Institute of Scrap Iron & Steel, Inc., at its recent meeting.

Kaiser, Reynolds Lose Fight For Higher Tariffs on Alumiunm

Washington—The Tariff Commission has denied the request of Reynolds Metals Co. and Kaiser Aluminum & Chemical Corp. for higher import duties on aluminum.

Reynolds petitioned in March to invoke the "escape clause" of current U. S. trade agreements on crude and semimanufactured aluminum. Kaiser filed a similar application in April.

The commission said that in light of the present shortage there will be "need for all the aluminum which can be obtained from any source, and imports from Canada will not be injurious."

Report on Jet Engine Alloys

Dayton, Ohio — United States Air Forces Air Materiel Command has released the preliminary report of a $100,000 research project on handling of superhard metals for jet aircraft engines. The report contains advanced principles of machining high temperature alloys which must be able to withstand terrific temperatures. Machining is expensive and time-consuming because often the jet engine alloy is harder than tools available to cut it.

NE War Contracts $1 Billion

Boston—Defense contracts in the New England area are believed to total more than $1 billion since the beginning of the Korean war, according to a statement by the New England Council.

Of this, only $100,000,000 has been let in publicly announced contracts. The remaining $900,000,000 is believed to have been let in contracts kept confidential for security reasons, according to the report.

British Steel Sees High Output

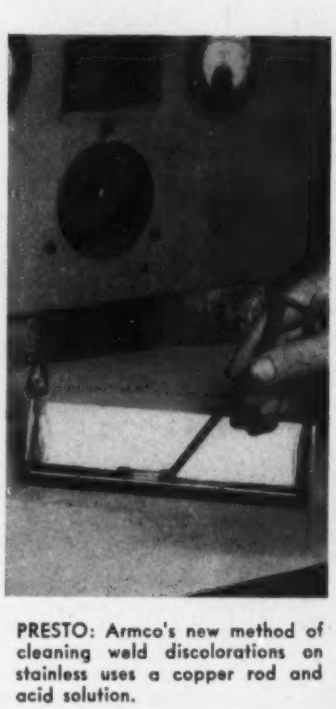
London—The British steel industry is aiming at a production figure of 18 million tons this year —which should be easily attained. October production was a rate of more than 18 million tons a year.

Weld Discolorations Vanish

Middletown, Ohio — Weld discoloration on stainless steel may be wiped out with a new simple method devised by Armco Steel Corp.'s Research Div. It is especially useful for interior welds.

The gadget's only parts are a copper rod, a dc power source, and electrical connections. The rod, about ¼ in. diam and bent into a handy shape, is insulated with rubber tubing to prevent its touching the steel and causing a short circuit.

Enough 50 pct phosphoric acid is poured into the welded corner to contact the rod and wet the discolored area. The rod is hooked up to the negative terminal of the dc source and the stainless to the positive.



PRESTO: Armco's new method of cleaning weld discolorations on stainless uses a copper rod and acid solution.

High Costs and Competition Blamed In Closing of AcMar Mine

Birmingham — "Coal has virtually priced itself out of the market," Prince DeBardeleben, Alabama Fuel & Iron Co. president, said in announcing closing of the AcMar mine after 40 years of operation.

Costs have increased so much coal no longer can compete with other cheaper fuels, he said. Fate of the company's last mine, at Margaret, is uncertain. The company's Overton mine closed several years ago.

The AcMar and Margaret mines, until last week, were the only rail-connected non-union mines in Alabama. Last week, at an NLRB election, workers voted to affiliate with the United Mine Workers of America. This permits AcMar miners to obtain work in other union mines.

Caterpillar Plans Distribution

Peoria, Ill.—A program for equitable distribution of machinery among its world-wide dealer organization has been announced by the Caterpillar Tractor Co. It applies at present only to track-type tractors, cable controls, bulldozers and motor graders.

The program is planned in view of the possibility it may be superseded by government controls, and priority orders may take precedence over all others.

New Electric Tractor Shown

Peoria, Ill.—A tractor with no clutch, no transmission, no differential, and incorporating a new method of power transmission has been announced by R. G. LeTourneau, Inc., manufacturer of earth-moving machinery.

The Tournatow, using diesel power to generate its own electric power, develops a pull of 400,000 lbs and is designed for forward, reverse and lateral movement, according to reports. The motors accelerate from standstill to full speed of 3600 rpm in 1/6 sec.

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Louisville Synthetic Rubber Plant To Be Reactivated In 1951

Pittsburgh—The 30,000 ton synthetic rubber plant at Louisville, Ky., is being reactivated, and may be in production early next year, ending a 3-year shutdown.

The Blaw-Knox Co. has been engaged by Firestone Tire and Rubber Co. to put the plant in operating condition. Firestone acted at request of the Rubber Reserve Corp. When ready, operations will be handled by Kentucky Synthetic Rubber Corp. Blaw-Knox built the plant in 1943 for the Defense Plant Corp.

Iron, Steel Castings Backlog Up

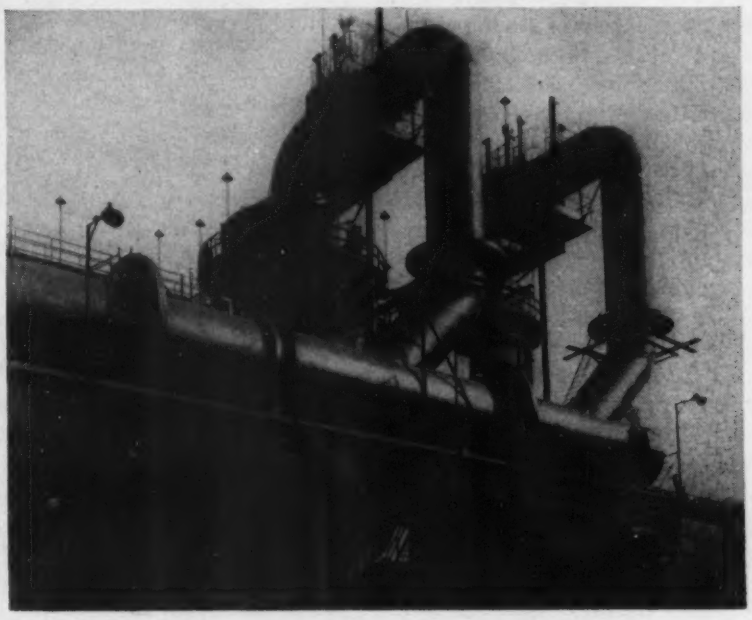
Philadelphia—Despite increased production and shipments of gray iron, steel, and nonferrous castings during October, the backlog of unfilled orders continued to mount, according to a report of the University of Pennsylvania.

Except for coke supplies, month end raw materials stocks in foundries were larger than at the beginning of the month. Scrap supplies increased throughout the district. At the current production rate orders on hand will keep foundries busy until about the end of December.

Calls Excess Profits Tax Unfair

Washington — Small business which must plow back earnings for expansion and replacement of worn-out equipment faces a stranglehold in the proposed excess profits tax, George S. Eaton, executive secretary of the National Tool and Die Manufacturers Assn., told the House Ways and Means Committee last week.

He spoke for 500 contract tool and die shops, which he said employ from five to 100 workers and are especially sensitive to the proposed tax. He pointed out that many shops in the past few years tried to rebuild their labor force and had a "very small profit average". They should not now be prevented from getting a fair return by a confiscatory excess profits tax, he said.



Smokeless Smoke Stacks

McKeesport, Pa.—A chilling sight in depression, smokeless smoke stacks are now poking their way up in industry as part of the accelerated battle against air pollution. Shown in the photograph, the gas washers and companion electrostatic precipitators at the McKeesport plant of the National Tube Co. purify blast furnace gases that fire five new boilers. The gas becomes cleaner than that breathed by the town's citizens.

If coal is used for a fuel instead of gas, National Tube has installed dust collectors to eliminate fly ash coming from boiler stacks. Coal is ground to powder and the little remaining fly ash is trapped in a system of filters between boiler furnaces and stacks.

Gas from National's four blast furnaces undergoes a 2-stage laundrying, going through the washers first and then through the precipitators. Dust content is reduced to about one-hundreth gram per cu ft. Iron dust gets the treatment in the washers from a multiple battery of water sprays. Recovered furnace gas dust becomes sludge in a thickening tank and iron-bearing particles are caked and used again in the furnaces.

Not only does the system end the smoke nuisance, for which industry has been getting an unrelenting pasting from government and press, but it is expected that the plant will recover about 100 tons of iron ore every 24 hours.

CCC Opens New Litho Can Plant

Birmingham — Continental Can Co's new Fairfield lithographing and enameling plant has begun operation. The plant will employ 150 men and serves southeastern packers. It is located adjacent to Tennessee Coal, Iron & Railroad Co.'s tin mill.

ISIS Gets Three New Members

Washington—New members of the Institute of Scrap Iron & Steel, Inc., are Apex Smelting Co., Chicago, and Universal Salvage Corp., Honolulu, made associate members, and Ohio Locomotive Crane Co., Bucyrus, Ohio, on the roster of the Northern Ohio Chapter.

Cut Down Industry's Reject Bill

New York—Greater standardization and more quality control is needed to reduce the $3 billion worth of faulty products that industry produces each year, said Howard Coonley, of the American Standards Assn., before the American Society of Mechanical Engineers' annual meeting here.

A manufacturer could keep track of the effectiveness of his production with a simple quality control chart if adoption of standards was widespread, he said.

Use of damage-free cars to reduce the railroads' annual rail loss and damage bill, amounting to $125 million in 1949, was discussed by Richard M. Lamport, assistant vice-president of the General American-Evans Co., Chicago.

U. S. Mills Use 7 Million Tons of Lake Ore in October

Cleveland — Consumption of Lake Superior iron ore during October amounted to 7,415,357 gross tons, of which U. S. furnaces used 7,135,752 tons and Canadian furnaces used 279,605 tons. This compares with total consumption of 7,174,745 tons in September 1950 and 876,792 tons in October a year ago, according to report of the Lake Superior Iron Ore Assn.

Cumulative consumption for 1950 to Nov. 1 amounts to 66,890,252 tons by U. S. furnaces, 2,496,465 tons by Canadian furnaces, totaling 69,386,717 gross tons. Cumulative totals to Nov. 1 a year ago were 58,332,181 tons for U. S. furnaces, 2,350,403 tons for Canadian furnaces, totaling 60,682,584 gross tons.

Ore at Furnaces

Ore on hand at furnaces and Lake Erie docks Nov. 1 amounted to 39,710,796 gross tons compared with 35,715,773 tons a month ago and 47,017,398 tons a year ago. Of this amount U. S. furnaces on Nov. 1 had 34,147,455 tons and Canadian furnaces had 1,503,968 tons. Lake Erie docks, U. S. only, had 4,059,373 tons. A month ago U. S. furnaces had 30,065,902 tons, Canadian furnaces had 1,322,276 tons and Lake Erie docks (U. S. only) had 4,327,595 tons. On Nov. 1 a year ago the total at U. S. furnaces was 37,995 tons, at Canadian furnaces 1,589,391 tons and at Lake Erie docks (U. S. only), 7,432,075.

There were 174 U. S. and 10 Canadian furnaces in blast Nov. 1 compared with 172 and 9, respectively, a month ago and 20 and 7, respectively, a year ago.

Zinc Stockpiling Forces Galvanized Cutbacks

Zinc inventories at lowest ebb in 25 years . . . Many firms report cutbacks on galvanized sheet, wire, pipe, and tubes . . . One firm uses more costly High Grade zinc.

Chicago—The zinc bottom under producers of galvanized steel products is dropping out because of a suddenly increased hunger of the government stockpile. Production of galvanized sheet, wire, pipe, and tubes is being cut back as a hasty shield for zinc inventories at their lowest ebb in 25 years.

Inland Steel shortened output of galvanized sheets in varying amounts ranging up to 50 pct. (THE IRON AGE, Nov. 23, 1950, p. 95.) Youngstown Sheet & Tube Co. has reduced galvanizing of some pipe and has been shipping some uncoated pipe. Consumers have the choice of using it black or painting it.

Lowered Spelter Supplies

Republic Steel Corp. has curtailed some galvanizing, reporting that spelter supplies have dropped about 20 pct. U. S. Steel Corp. discloses that interrupted shipment of zinc will force an immediate cutback. West Coast firms were also caught in the shortage and were reportedly cutting back.

One large producer in the East is snubbing its export market on galvanized pipe and diverting what is gained to domestic consumers.

A major midwestern producer plans a 40 pct cutback on galvanized wire for December. It is also dropping some of the less popular types of wire from production and cutting back drastically on heavy coating galvanized wire which slices more deeply into zinc stocks.

Unload Into Production

Some firms in the midwest report situations in which delivery trucks unload zinc practically into immediate production. Others report only 2 or 3 day supplies and one producer has already reduced production by 50 pct. Some producers of galvanized pipe and tubing are reportedly lagging 30 to 50 pct behind in shipments.

More fortunate firms with stronger zinc inventories and supplies are mixing more costly High Grade zinc with Prime Western to keep production from dipping.

"Er—Wanda,—as a result of a resolution passed by the Board, tool crib employees will wear this uniform."

Westinghouse Production Record

Mansfield, Ohio—The highest production and sales volume in history, representing an increase of 70 pct over 1949, is reported by the Westinghouse Electric Appliance Div. Unit production here and at Springfield, Mass., totaled 3,297,752 for 1950 and total sales billed ran $180 million.

Lament of a Steelman

London—Wearing a black tie as he presided over the final meeting of United Steel Companies stockholders recently, Sir Walter Benton Jones, chairman, charged that not only was the Labor Government intent on nationalizing the steel industry but was trying to rob it of over $153 million. Labor will pay out $59,640,000 in steel stock shares to present stockholders under the Nationalization Act, he said. That sum represents the value of the works in 1913 not in these inflated times. Replacement of plants now would cost $212,800,000.

Radio Speeds Material Handling

Chicago—A two-way radio system mounted on material handling trucks in the Johnson & Johnson shipping center at Metuchen, N. J., is cutting dollars from one of industry's biggest cost headaches, materials handling, it is reported.

Less paper work, less deadheading, faster deliveries and generally less confusion are claimed as results of the novel installation at the Metuchen plant.

Woodside to Head NSRB Office

Washington—Byron D. Woodside, formerly assistant director of the Security and Exchange Commission's Div. of Corporation Finance, will head the newly-created Business Expansion Office of the National Security Resources Board about Dec. 1. He has been associated with the SEC since 1934.

NPA Limits Cobalt Stocks

Washington—The National Production Authority this week was preparing to issue an order limiting cobalt stocks of manufacturers to a 20-day working inventory. Officials are also working on the drafting of definite regulations of the metal for application to first quarter 1951.

SKF Sees Heavy Bearing Demand

Philadelphia—Continued heavy demand for anti-friction bearings for new railroad rolling stock was forecast by SKF Industries, Inc., in announcing orders for spherical roller bearing journal boxes for 97 diesel-electric locomotives and 50 passenger car units.

Thirty of the engines are being built by Baldwin for Pennsylvania R.R., 49 for New York Central, 10 for Atchison, Topeka & Santa Fe, and eight for the Erie. Of the passenger cars, 30 will go to Paulisto Railways of Brazil, and 20 are RDC commuter cars developed by Budd Co.

Chrysler Reports Net Earnings

Detroit—Chrysler Corp. has reported net earnings from all sources for the first 9 months of 1950 as $105,246,991 compared with $97,651,453 during the same period of 1949.

Aircraft Skilled Labor Shortage

Washington—A serious shortage of sheet metal workers, welders, machinists, tool designers and other related help looms with aircraft industry speed-up.

Employment has risen from 256,000 in June to 291,000 in October, according to the Labor Dept. Many of the employees added since June have been in the skilled class and the industry is about ready to launch heavy recruiting of unskilled labor.

Lukens Steel Earnings Off

Coatesville, Pa.—Net earnings before taxes of $1,304,086 for the 36-week period ending July 8, 1950, have been reported by Lukens Steel Co. This compares with $4,710,020 for the comparable period in 1949. Sales for the 1950 period were $32,320,697 compared with $46,942,027 for the same period in 1949.

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Steelworkers Vote 3-to-1 To Bargain with Mills for Union Shop

Interest high; 91 pct eligible vote . . . USW suffers only one setback.

Pittsburgh—The nation's steelworkers are voting better than 3-to-1 in favor of their union leaders entering into negotiations with producers for the union shop.

A sampling of more recent National Labor Relations Board elections in which this question was put to the workers, showed the vote was 88,306 in favor, to 25,294 against. That there is a real interest by the workers is evidenced in the fact that 91 pct of those eligible took the time to vote.

Only one setback was suffered by the United Steelworkers of America (CIO). Electrical workers of Carnegie-Illinois Steel Corp., voted 1258 in favor to 1221 against. The question was lost because those in favor did not constitute a majority of the 3215 eligible to vote.

Voting Scoreboard

Carnegie-Illinois production and maintenance workers voted 48,541 in favor to 14,345 against; Pittsburgh Steel result was 5521 for and 303 against; Pittsburgh Steel office workers voted 218 to 41 in favor. American Bridge Co. vote was 3649 in favor, 485 against; National Tube Co., 11,554 in favor, 4831 against; Crucible Steel Co., 8061 in favor, 1778 against; Sharon Steel, 3788 in favor, 1768 against.

In 15 plants of Continental Can Co., the total vote was 6974 in favor, 523 against.

Mines Output Doubles Per Manhour

Washington—New mechanized mining operations and the trend toward extracting coal, iron, and nonferrous metals from open pits or strip mines has more than doubled the output per manhour in the Nation's mining industries between 1915 and 1950, reveals a Bureau of Labor Statistics report.

Improved drills, better shoveling and support operations, improvements in open-pit draglines, and ore transportation to surface have made copper, lead, and zinc mines more efficient. Improvements in ore treatment in nonferrous metals mines have also made it possible to use lower grade ores.

Snow Over Pittsburgh Chills Steel's High Production Fever

Pittsburgh—Because of the record snowfall that had reached 27 in. by Monday, mills in the Pittsburgh District were forced to curtail operations sharply. Indications were that the operating rate for the week would be around 61 pct, a drop of about 39 pct from the rate in recent weeks.

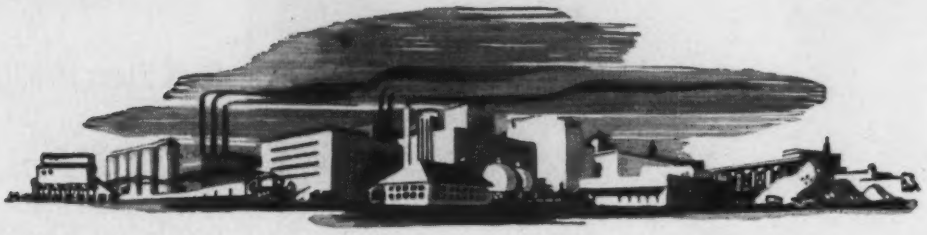
Carnegie-Illinois Steel Corp. was losing about 32,000 ingot tons per day on Monday, when operations were at a complete standstill and expected to continue at little better than 40 pct for the week. National Tube Co. expected to average 80 pct; American Steel & Wire, at Donora, 60 pct; and Pittsburgh Steel Co. expected to average 50 pct for the week.

Weirton Steel Co. was struggling along at 50 pct on Monday but looked for some improvement during the week. Jones & Laughlin was producing some coke, iron, and its bloomer was operating on Monday. Some J. & L. openhearths also were producing. Bethlehem, Crucible, Allegheny Ludlum and Armco also were hard hit.

Stratojet Uses Bronze Weights

New York—Extruded bronze counter-weights in the tail section of the B-47B Stratojet, a 600 mph, 6-jet, swept-wing U. S. Air Force medium bomber helped solve a tough engineering problem and saved the Government many thousands of dollars.

Steel weights are normally used in the tail sections to eliminate flutter and obtain smoother control. Use of steel here would have required shifting of the fluxgate compass from its most ideal location. Extruded bronze, nonmagnetic, solved the problem of compass location and saved much machining.



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It happened in Philadelphia, in a plant* where ten machines with 560 bearings were being lubricated by old-fashioned methods that wasted valuable production time.

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No matter what size or type of plant you operate, Alemite can show you dozens of ways to make worthwhile savings through more efficient handling of petroleum products. These are facts which you can readily confirm in your own time studies. Contact your local Alemite Industrial Distributor now. Or send for free booklet "11 Ways to Cut Production Costs." Simply attach coupon below to your letterhead. Alemite, Dept. N-110, 1850 Diversey Parkway, Chicago 14, Ill.

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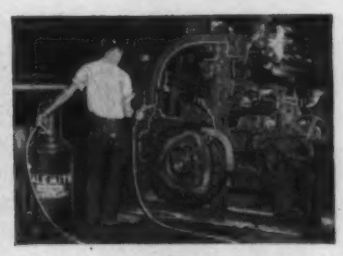

3. ***In Applying Lubricants . . .*** by saving up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

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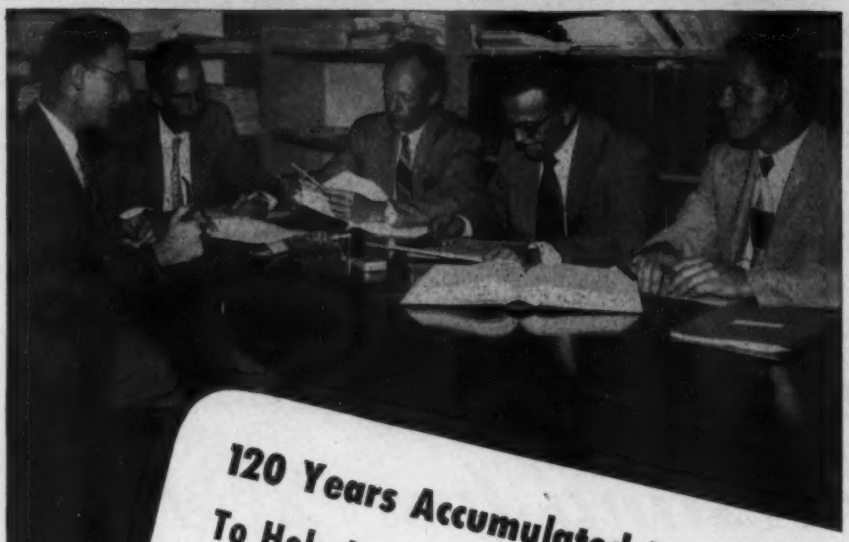

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Here's a picture of Arcos welding experience at work—the technical staff in a huddle over a customer's problem. They can answer more than "What electrode should I use?" Typical of the questions they answer every day are . . . "What cooling rate do you use when welding 7% chrome pipe?" "What electrode do you use for welds when operating temperatures are -40° F.? -150° F.? -320° F.?

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NAEC Plans Mobilization Meeting

Detroit—An industrial mobilization theme will keynote the Dec. 12 meeting of engineering company representatives at the Detroit-Leland Hotel here. The meeting will be sponsored by the National Assn. of Engineering Companies.

H. L. Tigges, vice-president of Baker Bros. and chairman of the Machine Tool Industry Mobilization Group, will speak on "Industrial Mobilization" while H. L. Murray, NAEC head, will describe what the association will do to keep up with the defense tempo of the times. New NAEC services to keep members informed on government activity are planned.

Sulphur Replaces Selenium

Reading, Pa.—Use of sulphur instead of selenium as the free machining agent in 303 stainless has been announced by Carpenter Steel Co. A sharp rise in price and possibility of selenium being used largely for defense orders were cited. Where selenium is specified or required, it will be furnished as long as available at an extra charge of 2½¢ per lb.

Italy's Automakers Boost Output

Rome—The Italian auto industry is driving a deeper wedge into the foreign market. It reported a 59.2 pct production increase in the first 9 months of 1950 and set a record in July. Exports rose 17.8 pct, most going to Germany. Output in the 9-month period was 90,607 units.

U. S. Output Soars After Korea

Washington — Gross national production for the third quarter 1950 was at a rate of $284 billion —about $14 billion above the pre-Korean rate.

For the same period, according to the Office of Business Economics, personal income rose by $7 billion to almost $148 billion. Wage and salary receipts rose from the second quarter rate of $148 billion to $155 billion.

Sweden's Aluminum Use Rises

Stockholm—Sweden's aluminum consumption has quadrupled in the past few years—stimulated by shortage of other metals. It now amounts to 18,000 tons per year. More than a quarter is produced from crude aluminum made at the Swedish Aluminum Co.'s plants in Mansbo and Kubikenborg. Imports from Canada and Norway furnish the balance.

Production at the Kubikenborg works will be accelerated to 6000 tons a year with an aim to pushing it up to 10,000 tons. Akers Styckebruk, tube manufacturer, plans to double its capacity. Sweden is planning a new power station at Liggaforsen on the Lule River.

See Record Truck Sales

Detroit—New truck registrations for 1950 will break all previous records, according to R. L. Polk & Co., Detroit, statisticians for the industry. Polk estimates total registration for the year may reach 1,125,000 trucks compared with the high set in 1948 of 1,035,174.

Polk said third quarter new passenger car registrations are running higher than 600,000 units for each of the three months with the September total reaching 625,755 units.

GM Net Earnings Pass '49 Peak

New York — General Motors Corp. earnings for the third quarter of 1950 totaled $217,377,767. This compares with $198,735,386 for the same period in 1949. Nine month earnings for 1950 were reported as $702,655,156 compared with $502,414,029 during the same period in 1949.

Wins Bridge Design Contest

Cleveland—James H. Jennison, of the U. S. Naval Ordnance Test Station, Pasadena, Calif., received the first award of $5000 for the 1950 Welded Bridge of the Future contest sponsored by the James F. Lincoln Arc Welding Foundation.

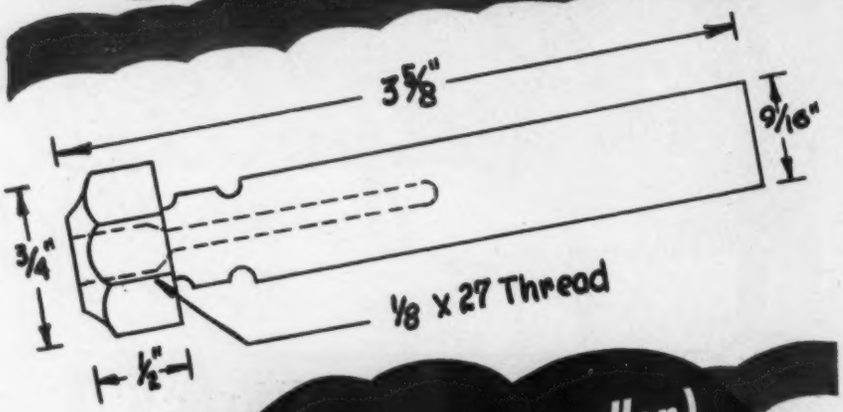
Specialized Wire for Specialized Products

This new wire developed by Keystone helps recessed head screw manufacturers to lower production costs. It delivers the desired forming and upsetting qualities uniformly. Because of excellent flow properties — die and plug life are often more than doubled — production records show fewer rejections and reduced inspection time. Keystone Cold Heading Wire is "special processed" for *tough* Cold Heading jobs.

Keystone's process of *drawing after galvanizing* smooths and hardens the zinc coating, increasing its lasting qualities and its physical properties. This shiny smooth finish, corrosion resistant Spring Wire is now available in Type 2 and Type 3 heavy weight zinc coating as well as the regular weight suitable for most applications.

If your product requires "special" steel wire, please consult us.

How to trade Pennies for Dollars



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PRICE alone makes no profit. The drawing above illustrates a shackle bolt which is drilled and tapped on a New Britain Automatic. Using an inferior cutting oil 12 taps were used up every 2½ days—12 pieces per tap. A change to Stuart's SPEEDKUT M on a 2½ day run showed 530 pieces per tap—no taps used up. The saving? Taking into full account the pennies-higher price of Stuart *quality* oil: $50 per day per machine!

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See 40,000 Ton Oil Tankers

New York—Forty thousand ton oil tankers for the Near East-United States haul are predicted by Walter L. Green, president of the American Bureau of Shipping.

The new tankers, in the design stage, will be 750 ft long, almost 100 ft longer than present 30,000 ton tankers. Operators have shown an interest in having them built, Mr. Green said. Designed to cruise at 16½ knots, the tankers would cost little more to operate than present large tankers. Additional capacity, however, would greatly cut petroleum transportation costs.

Aluminum Foundry Now Producing

Yellow Springs, Ohio—A new aluminum precision molding foundry that consolidates activities previously carried on at two different locations, has been put into operation by Morris Bean & Co. here.

Designed and constructed by H. K. Ferguson Co. for about $600,000, the new foundry building provides more than 60,000 sq ft of floor space. It makes aluminum precision castings for the aircraft industry.

Housing Starts Continue High

Washington — Credit curbs on housing had not yet made their effects felt as of Nov. 1, with more than 103,000 home units started in October, nearly equal to the same month in peak 1949. Total home starts for the first 10 months 1950 amounted to 1,210,000 units compared with 851,000 for the same period last year. Public housing accounted for 23,000 units, a third less than during 1949.

Scrap Units Pick Presidents

Washington — Stanley Claster, Luria Bros. & Co., Inc., San Francisco, was voted president of the Northern California chapter of the Institute of Scrap Iron & Steel, Inc. Nathan Winski, Northern Indiana Steel Supply Co., Inc., Michigan City, Ind., was elected head of the Indiana Chapter.

STEEL CONSTRUCTION NEWS

New York—The bookings of fabricated structural steel for October, amounting to 233,922 tons, continued at practically the same high level as established in the four previous months. According to reports received by the American Institute of Steel Construction, Inc., the bookings for the first ten months of this year totaled 2,057,276 tons, 71 pct greater than for the corresponding period in 1949, and the highest since 1930 when 2,385,600 tons were reported booked for the ten month period.

October shipments of 167,693 tons showed a 7 pct increase over September, and were 68 pct greater than the shipments in October, 1949. The ten months shipments totaled 1,573,268 tons, just under the 1,600,856 tons shipped in the same period of the previous year.

The backlog (tonnage of orders booked and available for future fabrication) for the next four months only, has increased to 746,878 tons.

Following is the complete tabulation of bookings and shipments:

Estimated Total Tonnage for the Entire Industry

Contracts Closed	1950	1949	Avg. 1936/1940
January	119,317	130,418	107,578
February	117,664	108,764	96,280
March	189,420	149,079	124,568
April	155,011	98,802	110,783
May	192,319	116,975	126,237
June	266,612	96,952	125,835
July	272,745*	126,255	152,481
August	259,212*	98,953	113,135
September	251,054*	120,373	137,982
October	233,922	158,593	141,557
Totals	2,057,276	1,205,164	1,236,426
Shipments			
January	135,253	152,746	92,578
February	129,628	145,879	88,626
March	156,781	185,885	115,031
April	164,440	179,206	123,650
May	168,113	171,101	123,225
June	172,096	172,260	129,969
July	141,576*	147,960	127,422
August	180,688*	183,868	136,389
September	157,000*	162,139	137,255
October	167,693	99,812	140,944
Total	1,573,268	1,600,856	1,215,089
Tonnage Available for Fabrication Within the Next Four Months	746,878	583,530	348,056

* Revised

Fabricated steel awards this week included the following:

1800 **Tons,** Chicago, Smith Furniture Co. building, to American Bridge Co.

1300 **Tons,** Wilmington, Del., merchandise market and stores for Metropolitan Merchandise Mart, Inc., to Bethlehem Steel Co., Bethlehem.

950 **Tons,** Sioux City, Ia., St. Joseph Mercy Hospital, to Gate City Steel Works Inc.

800 **Tons,** Sayreville, N. J., National Lead Co. plant expansion, United Engineers & Constructors, Inc., general contractors, award divided between Frank N. Weaver Co., Lansdale, Pa., and Elizabeth Iron Works, Elizabeth, N. J.

600 **Tons,** Elizabethton, Tenn., power house extension for North American Rayon Corporation through Stone & Webster Engineering Corp., Boston, to Bristol Iron and Steel Works, Bristol, Va.

600 **Tons,** Riverdale, N. D., Service bridge for Corps of Engineers, to American Bridge Co.

515 **Tons,** Paulsboro, N. J., oil storage tank plate work for Patterson Oil Terminals, Inc., to Bethlehem Steel Co., Bethlehem.

400 **Tons,** Wilkes-Barre, Pa., highway bridge reconstruction for Pennsylvania Dept. of Highways, Pinebrook Iron Works, Scranton, Pa., low bidder.

385 **Tons,** Dearborn City, Ind., bridge, to Midland Structural Steel Co.

360 **Tons,** Cumberland County, Pa., bridge on State Highway LR 770, Sect. 1, Richard Nissley, general contractor, to Bethlehem Steel Co., Bethlehem.

350 **Tons,** Camden, N. J., bridge for New Jersey State Highway Dept., F. A. Canuso & Son, general contractor, to American Bridge Co., Pittsburgh.

325 **Tons,** Clark County, Ind., bridge contract 3317, to American Bridge Co.

290 **Tons,** Philadelphia, building for McIlvain Lumber Co., to Easton Steel Structures, Inc., Easton, Pa.

260 **Tons,** Philadelphia, new building for Peirce-Phelps Mfg. Co., to Bethlehem Steel Co., Bethlehem.

225 **Tons,** State of Kansas, Union Pacific R. R., seven beam spans to American Bridge Co.

195 **Tons,** Jefferson County, Colo., bridge project F-005-3/5/, to American Bridge Co.

180 **Tons,** Sheboygan, Wis., R-Way Furniture Co. building, to Wisconsin Bridge Co.

180 **Tons,** Nicollet County, Minn., bridges 1977 and 2094, to American Bridge Co.

155 **Tons,** Itasca County, Minn., bridge 6658, to American Bridge Co.

150 **Tons,** Berlin, N. J., building for Owens Illinois Glass Co., to Hughes-Foulkrod Co., Philadelphia.

140 **Tons,** Northumberland and Montour Counties, Pa., bridge, for Pennsylvania Dept. of Highways, to American Bridge Co., Pittsburgh.

110 **Tons,** Harrisburg, Pa., medical buildings for Capital Group, Inc., Guy Shelley, general contractor.

Fabricated steel inquiries this week included the following:

1080 **Tons,** Montgomery County, Pa., highway bridges for Pennsylvania State Highway and Bridge Authority, bids due Dec. 27.

700 **Tons,** Bethlehem, Pa., Rehabilitation of Navy Dept. Bldg. No. 17, bids due Nov. 30.

600 **Tons,** Lehigh County, Pa., highway bridge for Pennsylvania State Highway and Bridge Authority, bids due Dec. 27.

500 **Tons,** Elizabeth, N. J., bridge for New Jersey Turnpike Commission, bids due Dec. 5.

253 **Tons,** Darien, Conn., 3 span rolled beam bridge, relocation of U. S. Route 1, E. T. Nettleton, New Haven, Conn., district engineer.

200 **Tons,** Minneapolis, University of Minnesota, Mayor Memorial Medical Center. Bids taken Nov. 29.

Reinforcing bar awards this week included the following:

750 **Tons,** Philadelphia, Wharton School of Business and Finance, University of Pennsylvania, to Bethlehem Steel Co., Bethlehem.

535 **Tons,** Chicago, Hall Printing Co., to Newburgh Co.

100 **Tons,** Camden, N. J., bridge on State Highway 151, Section 1B. F. A. Canuso & Son, general contractors, to Bethlehem Steel Co., Bethlehem.

100 **Tons,** Northumberland and Montour Counties, Pa., bridge on Route 634 for Pennsylvania Dept. of Highways, Reed & Kuhn, Elysburg, Pa., general contractors, to Bethlehem Steel Co., Bethlehem.

Reinforcing bar inquiries this week included the following:

112 **Tons,** Darien, Conn., 3 span rolled beam bridge, relocation U. S. Route 1.

Steel piling inquiries this week included the following:

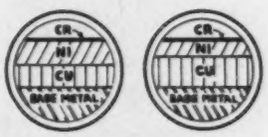
196 **Tons,** Darien, Conn., 3 span rolled beam bridge, relocation U. S. 1.

News about UNICHROME COATINGS for METALS

METALLIC • ORGANIC
DECORATIVE • PROTECTIVE

HOW TO EASE METAL SHORTAGE HEADACHES

Here are three ways you can ease the production pinch caused by shortages in metal finishing materials:



Copper can save nickel

Where your specifications call for plating copper and nickel prior to chromium, a decrease in the thickness of nickel with a compensating increase in copper will still give you a product with good corrosion resistance. Unichrome Pyrophosphate Copper Plating Process is especially suited for this job, since it yields a smooth, fine-grained dense deposit that needs little buffing, if at all.

Conserve chromium while increasing output

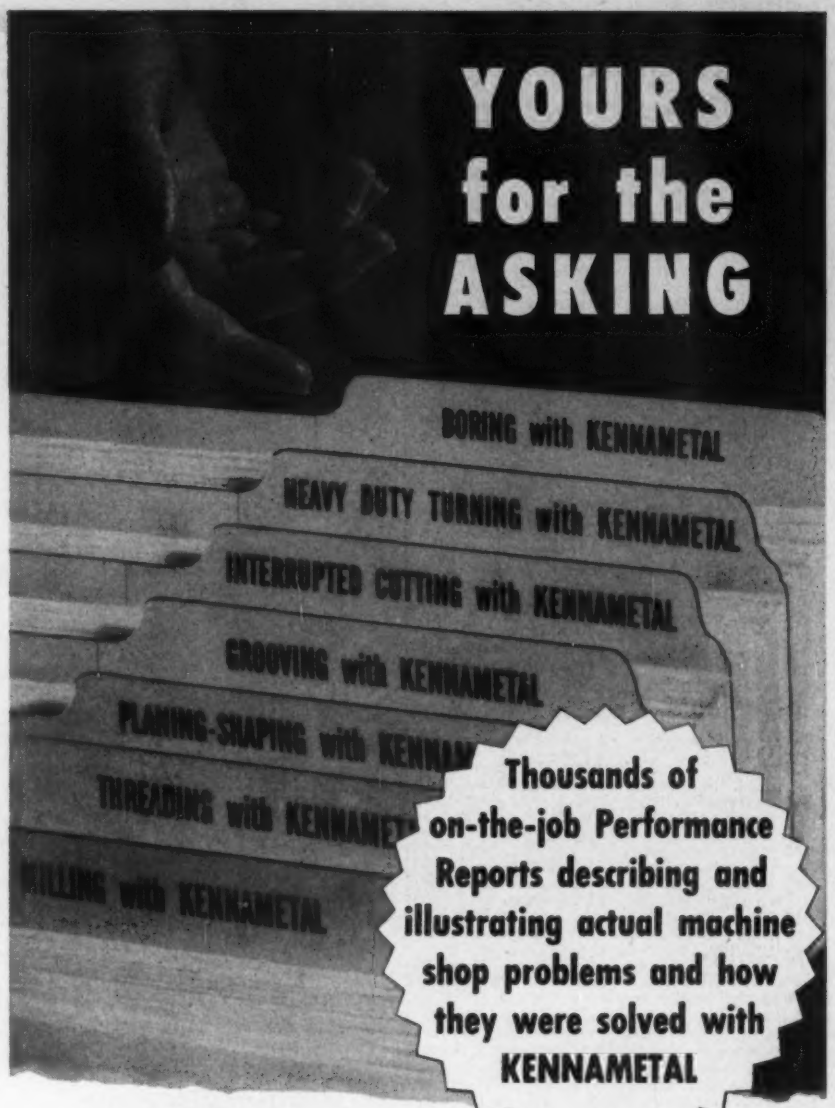
Hundreds of companies using Unichrome S.R.H.S. Chromium Solution have been benefiting by high speed chromium plating. Today, with shortages, this bath is all the more valuable in sustaining production. Since more dilute S.R.H.S. baths can be used, appreciable amounts of chromic acid are conserved. One company, in fact, saves as much as 25%.

Where it pays to cut plating thickness

All-metal finishes supply best wear resistance. But in many cases, where products are plated mainly for appearance and don't get much handling, a thinner deposit followed by application of a clear Unichrome lacquer or synthetic will do the job. The result: You save metal supplies and still turn out a high quality product.

UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N. Y.
Detroit 20, Mich. • Waterbury 90, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto, Ont.



• Suppose you could ask thousands of practical machine shop men —*"What was the best production idea you had this year?"* Wouldn't their answers save you headaches, time, and money?

Kennametal Inc. has the answers—more *practical* information on jobs of diversified types on all kinds of materials than has ever before been accumulated and offered.

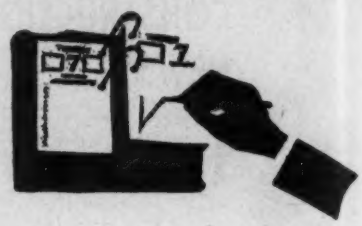
Jobs are classified so that we can send you data sheets on that type of work that interests you. Just ask for Performance Reports and mention the general type of job and material.

Do we have reports on the "tough" jobs you have solved with Kennametal tooling? Our representative who calls on you will appreciate the details.

KENNAMETAL *Inc.*, Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES
AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

Dates to Remember



Nov. 27-Dec. 2—American Society of Mechanical Engineers, national power show, Grand Central Palace, New York. Society headquarters are at 29 W. 39th St., New York.

Dec. 3-5—Hydraulic Institute, annual meeting, Seaview Country Club, Absecon, N. J. Institute headquarters are at 122 E. 42nd St., New York.

Dec. 3-6—American Institute of Chemical Engineers, annual meeting, Nell House, Columbus, Ohio. Institute headquarters are at 120 E. 41st St., New York.

Dec. 5—Spring Manufacturers Assn., annual meeting, Hotel Biltmore, New York. Association headquarters are at 249 Main St., Bristol, Conn.

Dec. 7—Material Handling Institute, annual meeting, Hotel New Yorker, New York. Institute headquarters are at 1108 Clark Bldg., Pittsburgh.

Dec. 7-9—American Institute of Mining & Metallurgical Engineers, Electric Furnace Steel Committee, annual conference, Hotel William Penn, Pittsburgh. Institute headquarters are at 29 W. 39th St., New York.

Dec. 12-14—Diesel Engine Manufacturers Assn., annual meeting, Union League Club, Chicago. Association headquarters are at 1 N. LaSalle St., Chicago.

Dec. 13-14—Power Crane & Shovel Assn., annual meeting, Edgewater Beach Hotel, Chicago. Association headquarters are at 74 Trinity Place, New York.

Dealers to See Mechanization

New York—Mechanization of metal scrap yards will be the theme of exhibits at the annual convention of the Institute of Scrap Iron & Steel, Inc., at the Hotel Commodore next Jan. 14 to 16.

Standards Group Plans Meeting

New York—The 32nd annual meeting of the National Standardization Conference was to be held Nov. 27 to 29 at the Waldorf-Astoria in conjunction with the annual meeting of the American Standards Assn.

FREE

PUBLICATIONS

Continued from Page 34

floor mounting. Detailed dimensions, weights, and other engineering layout data are given, including a page on how to select the right size of screen for handling a given capacity of material per hour over square openings of up to 3 in. *Link-Belt Co.*

For free copy insert No. 7 on postcard, p. 35.

Presses and Shears

Complete specifications on 15 models of Johnson inclinable power presses ranging from 16 to 90 tons in capacity, and 3 models of the Hydra-Shear handling up to 10 gage mild steel sheet metal, are contained in a new 4-p. folder. Design features that provide extra safety, power, and adaptability are described, and the various models available are illustrated. *Johnson Machine & Press Corp.*

For free copy insert No. 8 on postcard, p. 35.

Precision Shaper

How countless jobs can be done accurately, quickly, easily and economically on the Delta 7-in. shaper is the subject of a new 8-p. booklet. Photos illustrate features of construction and show various phases of operation. Specifications are included, along with description of extra equipment. A portable cabinet, available as optional equipment for this bench model shaper, is also described. *Delta Power Tool Div., Rockwell Mfg. Co.*

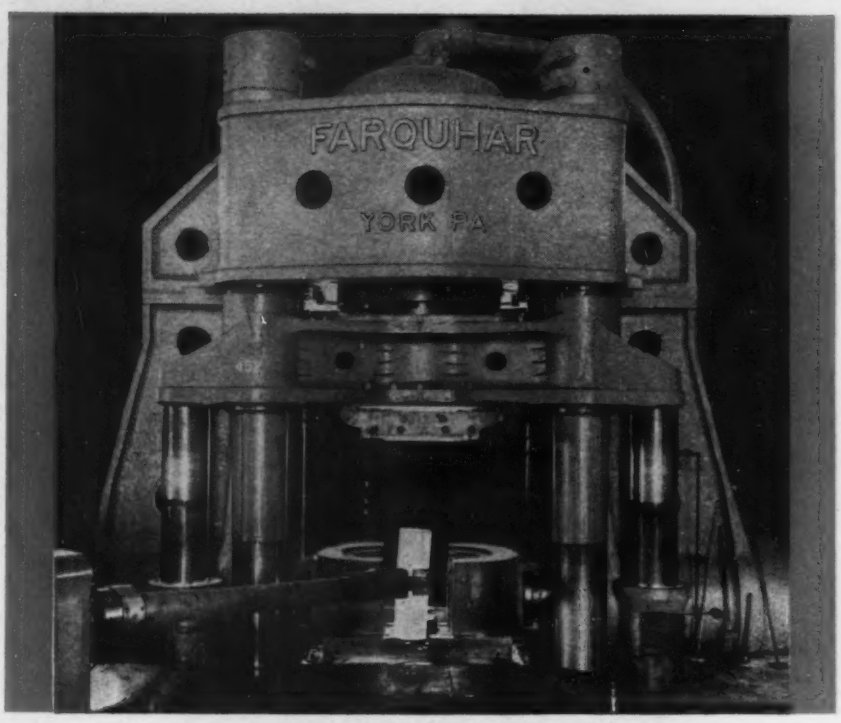
For free copy insert No. 9 on postcard, p. 35.

Power Ventilator

The Iron Lung, a roof ventilator engineered strictly for power operation, is detailed in a new 32-p. booklet. Features of the unit that provide trouble-free operation in exhausting large volumes of polluted air from busy industrial buildings are described, and complete specifications of the various models shown are listed. *Iron Lung Ventilator Co.*

For free copy insert No. 10 on postcard, p. 35.

Resume your reading on Page 35



FARQUHAR HYDRAULIC PRESS

turns out better forgings *faster* for Cameron Iron Works

This Giant 5000-ton Farquhar Hydraulic Press has a big job to do at the Cameron Iron Works, of Houston, Texas—and it's doing it!

Cameron needed faster and better production of tubing head spools which are used in the oil industry for capping wells. These parts had formerly been produced from steel castings. By using the built-to-specification Farquhar Press to turn out 800-lb. forgings of the spools instead, Cameron speeded up production, saved time and labor.

Advantages of forgings by the Farquhar Press over the castings are: Cheaper to produce . . . Free from porosity . . . Uniform in physical properties . . . Controlled in grain structure. Cameron gets higher quality at lower costs for this operation—still can convert the press for other production jobs in the future.

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in heavy production. Farquhar Presses are built for the job . . . presses that assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on moving platen . . . easy, smooth operation with finger-tip controls . . . longer die life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Give them a call.

Send for Free Catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: A. B. Farquhar Co., *Hydraulic Press Division*, 1503 Duke St., York, Pa.

GET THE DETAILS on how our Deferred Payment Plan helps you pay for your Farquhar Hydraulic Press out of the savings it produces!

Farquhar
HYDRAULIC PRESSES
for Bending • Forming • Forcing • Straightening • Assembling • Drawing
Extruding • Jogging • Forging • and other Metal-working Operations

"Certainly SAVES STEPS, Eh, Plunkett!"

Production slow?... Costs up?... Profits going for a ride?... All because your light metals fabricating takes just too many operations? Then, step up and meet pre-coated *THOMAS STRIP—one of the greatest production step-savers ever presented.*

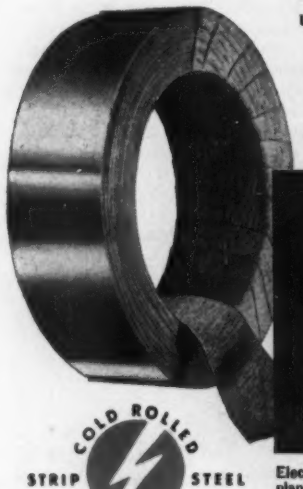
★ ★ ★

Consider the many step-saving qualities of Copper Coated THOMAS STRIP, for example. First, it saves you steps by protecting parts in process against rust. And, this tightly adherent, uniform copper *pre-coat* speeds production in all tinning, soldering and brazing—often replacing more expensive metals for these operations.

It comes to you wearing a clean, bright surface suited to many functional applications . . . saves more steps by serving as an already-applied final product finish for parts in interior use. Use it to eliminate costly batch plating of formed and drawn parts.

What's more, it is an effective die lubricant, and is manufactured in special deep drawing quality.

A test run in your plant on your equipment can develop many specific cases in which pre-coated THOMAS STRIP will save steps, speed production, cut costs. Write us for more information and for samples.



THE THOMAS STEEL COMPANY
WARREN, OHIO
Specialists in Cold Rolled Strip Steel

Thomas Strip
SPEEDS PRODUCTION . . . CUTS COSTS

COLD ROLLED STRIP STEEL

Electrocoated with Zinc, Copper, Brass, Nickel and Chromium • In natural, planished and buffed finishes • Hot Dip Tin and Lead Alloy Coatings • Lacquer Coated in Colors • Annealed Spring Steel • Alloy Strip Steel • Uncoated Strip Steel Produced to Your Specifications.

NEW

PRODUCTION IDEAS

Continued from Page 38

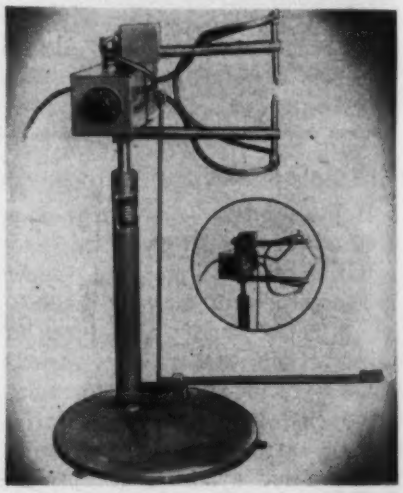
sealing, and steam traps. They provide flexible joints for instruments that combine rotary motion and hermetic seal and the transmission of movement hydraulically to remote points. In the larger sizes, the bellows can be used for expansion joints for large jet engines and gas turbines. *Clifford Mfg. Co.*

For more data insert No. 26 on postcard, p. 35.

Spot Welder

Reversible arms give vertical and slant electrode holder mounting.

A new simple spot welder for general use is the rocker arm type, rated 5 kva 220 v 60 cycle 50 pct



duty cycle in accord with RWMA practices. Welds can be made in sheets from 2 No. 28 to 2 No. 20 gage steel. Throat depth may be varied from 3 to 15 in. by adjusting the arm length. The welder is available with air cooled and water cooled point holders. Electronic timers are available. *Universal Welder Corp.*

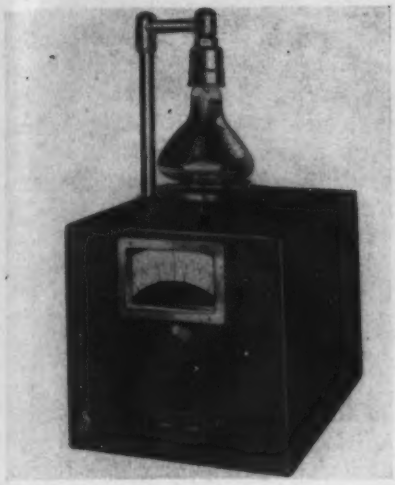
For more data insert No. 27 on postcard, p. 35.

Sand Moisture Tester

Makes determination test quickly and automatically.

The operation of the new moisture tester is so simple that a skilled operator is not required and tests can be made at any location where an electrical connection is available.

The gravimeter principle employed in the instrument is said to give definite and reliable results, showing the moisture percentage on a dial. A complete test can be made



in from 2 to 5 min. The tester is a self-contained instrument complete with sensitive balance and heat bulb for drying the material by radiant heat. *Claud S. Gordon Co.*

For more data insert No. 28 on postcard, p. 35.

Improved Tractor-Shovel

Faster, more rugged, more powerful.

A new higher compression engine gives more power and economy to the small, compact 12 cu ft Payloader tractor-shovel; the clutch is larger; and the operator's compartment is roomier and more comfortable. The steering gear and linkage is more rugged; main frame is stronger; and a constant mesh transmission insures faster, quieter operation. *Frank G. Hough Co.*

For more data insert No. 29 on postcard, p. 35.

Metering Pump

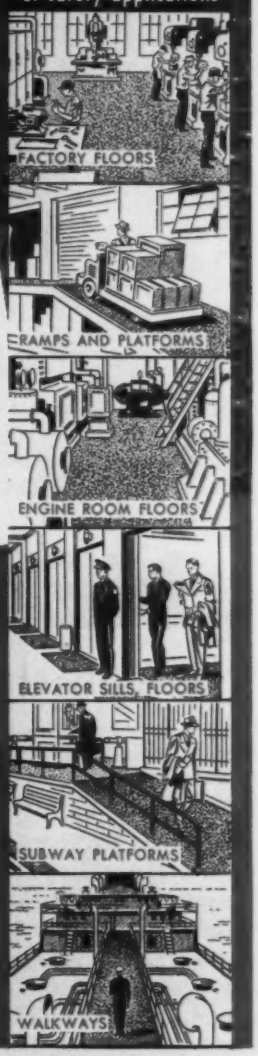
Ejects fluids and semi-fluids.

A new metering pump for hot waxes and cements is a variable-discharge spur gear pump equipped with a single revolution clutch. The

Only one rolled steel floor plate gives you complete *anti-skid* protection

NON-SLIP EVEN ON STEEP INCLINES

A.W. ALGRIP has hundreds of safety applications



It's New, Revolutionary

ALGRIP

ABRASIVE ROLLED STEEL FLOOR PLATE

There's nothing like it, absolutely nothing like A.W. ALGRIP. It's the one and only Abrasive Rolled Steel Floor Plate. A.W. ALGRIP is made by rolling tough abrasive grain (the same type used in grinding wheels) as an integral part of the upper portion of steel floor plate. Result: A floor plate that's truly non-slip even when wet or on steep inclines. It keeps men's feet safe and secure.

Because Algrip is rolled steel, it is stronger than other abrasive floorings and withstands severe punishment without cracking or chipping. Then, too, thinner sections may be used without reducing load carrying capacity.

Get complete information about A.W. ALGRIP now. Write or use the coupon for a FREE copy of our 8-Page Catalog.

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A.W. ALGRIP ABRASIVE ROLLED STEEL FLOOR PLATE

A Product of **ALAN WOOD STEEL COMPANY**

CONSHOHOCKEN A-19, PA.

Gentlemen: *Please rush me complete information and a FREE copy of your 8-PAGE A. W. ALGRIP Booklet.*

Name _____ *Title* _____

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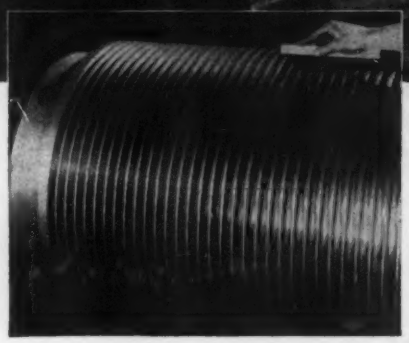
Other Products: PERMACLAD Stainless Clad Steel • A.W. SUPER-DIAMOND Floor Plate • Billets Plates • Sheets • Strip • (Alloy and Special Grades)

SHENANGO-PENN Centrifugal CASTINGS ... KEY TO SAVINGS



220-groove Fourdrinier wire cloth warp roll of alloy iron, shown during and after precision machining and grooving. Shenango-Penn centrifugal casting process gave highly desirable uniformity and extra strength to avoid distortion in service due to weight of roll and tension of warp wires.

NEED ROLLS?

Weigh these money-saving facts!

MORE and more industries and suppliers are turning to Shenango-Penn for rolls and roll assemblies because . . .

1. Shenango-Penn's carefully controlled centrifugal casting process, a natural for tough roll service, assures greater strength and uniformity, exceptionally fine pressure-dense grain, and freedom from blow holes, sand inclusions and other often hidden defects. It means much greater wear-life, less maintenance and replacement, plus ability to take abnormal loads and speeds without risking costly failure.

2. Shenango-Penn has the modern machining and finishing facilities, plus the years of specialized experience in producing quality rolls, that will meet your specifications with over-all precision. You save time and avoid trouble . . . both in installation and during subsequent use.

The big special roll shown and described above is one of the many varieties made by Shenango-Penn. For bulletins, for specific data on rolls or roll assemblies of *any* size or type, ferrous or non-ferrous, write to . . .

SHENANGO-PENN MOLD COMPANY

585 West Third Street • Dover, Ohio

Executive Offices: Pittsburgh, Pa.

SHENANGO P PENN

All Bronzes • Monel Metal • Ni-Resist • Meehanite® Metal

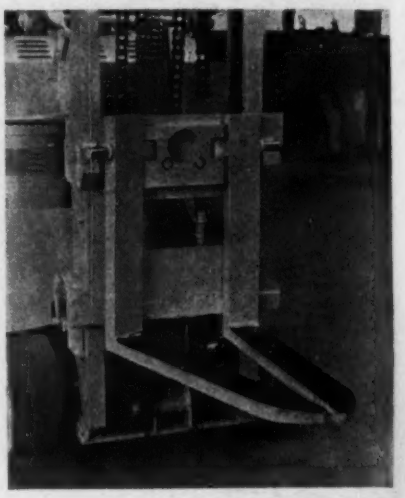
amount discharged per cycle is changed by setting a cam. For materials requiring heat to achieve a fluid consistency, thermostatically controlled strip and cartridge heaters are provided for the 1½ gal tank, producing controlled temperatures up to 450°F. Various nozzles meet different filling requirements. *Edward E. Robinson, Inc.*

For more data insert No. 30 on postcard, p. 35.

Pivoted Fork Tines

Swing inward for maneuvering material in close quarters.

Vertically pivoted forks for use on high-lift power industrial trucks are furnished as an integral part of some Elwell-Parker fork trucks,



or may be supplied as an attachment for standard models. Tines are used either in the ordinary way or may be quickly adjusted for unusual conditions relating to size or position of the load. The truck and pallet need not be in alignment as a preliminary to lifting or depositing a load. *Elwell-Parker Co.*

For more data insert No. 31 on postcard, p. 35.

Pre-Shaped Steels

Will eliminate many machining operations on steel parts.

Steel bar stock cold drawn in special sections to fit specific uses is now available. This development minimizes or virtually eliminates machining operations in the quantity-production of steel component parts, with machining in some cases being reduced to a simple cut-off operation. The types of steel available

LONG ON QUALITY SHORT ON PRICE

KRW HYDRAULIC PRESSES

By any standard of comparison, the proven fact is: you pay far less in dollars and get far more in performance when you insist on a KRW Hydraulic Press. The specifications prove it's true, so do performance records, and so do the expert opinions of KRW owners. The price tag tells you one thing—the dollars you save. The unexcelled quality standards tell you another—the dollars you'll make! You should get both when you buy! Write or wire for the full facts and prices!

BRIEFED SPECIFICATIONS

Self-contained steel construction. Maximum strength, minimum weight. Saves floor space. Precision honed cylinders. Adjustable limit switch for top return position of ram. Adjustable tonnage pressure control. Safety by-pass prevents over-loading. Large self-contained oil reservoir. Direct connected motor drive to pumps through easily serviced flexible couplings. Safety controls prevent accidents. Long bronze faced gibs adjustable for wear insure accurate travel of slide. Quiet and vibrationless. Can be custom built to meet your requirements.

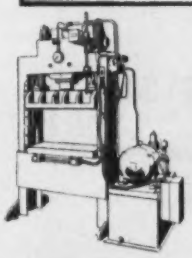
TWO CYLINDER TYPE

Tons capacity: 60, 85, 100. Platen and bolster, maximum usable size: F to B, R to L, 36" x 60". Stroke: 6", 11". Bed, fixed. Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.

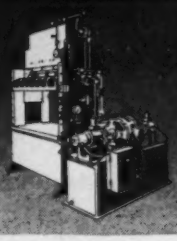
ONE CYLINDER TYPE

Tons capacity: 25, 50, 75, 100, 125, 150. Platen and bolster, maximum usable size: 24", F to B, 36" R to L. Stroke: 6", 11", 18". Bed adjustment: increments of 6". Controls: Manual, Semi-Automatic, Fully Automatic for cycled operation.

Write or wire for the full facts and prices.
K. R. WILSON
215 MAIN STREET
BUFFALO 3, N. Y.
Dept. 83



K·R·WILSON



WHO...

makes precision "milled from the bar" screw machine products that stand up under hard usage . . . and whose uniformity and fine finish save assembly time and maintenance costs.

Wm H. Ottemiller Co.
YORK, PENNA.

. . . in all sizes and threads.

A Perforating Service to Industry Since 1883

AVAILABLE in patterns to suit all industrial and ornamental uses.

GAUGES from tissue thickness to 1" steel plates or equivalent.

RANGE round perforations from .020" to 9" — slots from .006" wide.

MATERIALS include any metal and most sheet materials.

ACCURACY accurate, uniform holes; tolerance held as close as ± .0005" when necessary.

FABRICATION perforated sheets rolled, formed or otherwise fabricated to order.

CATALOG No. 62 gives full details—write for it!

The Harrington & King Perforating Co

5657 Fillmore St., Chicago 44, Ill., 114 Liberty St., New York 6, N. Y.

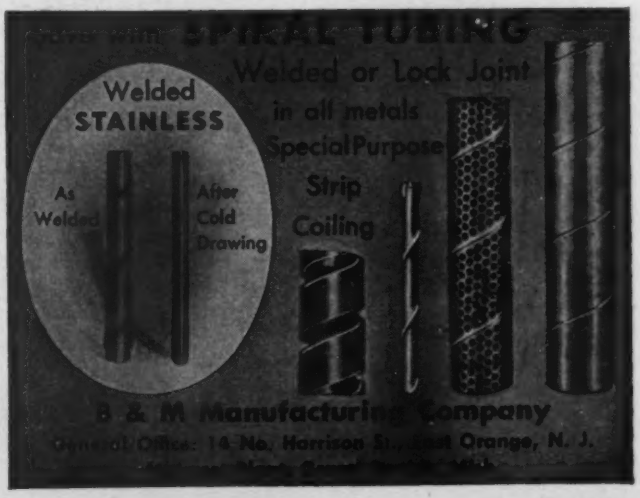
CUSTOM BUILT MACHINERY
FOR OVER 75 YEARS

DIXIE-COWDREY
Machine Corporation

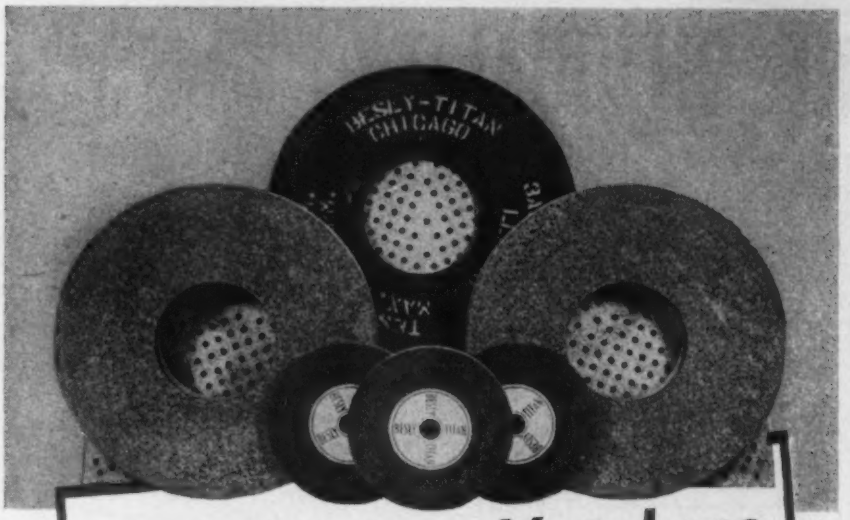
(A subsidiary of the Dixie Cup Co.)

Write:
DIXIE-COWDREY
Fitchburg, Mass.
Telephone: Fitchburg 5200

● DESIGNERS AND BUILDERS OF SPECIAL PURPOSE MACHINERY



B & M Manufacturing Company
General Offices: 14 No. Harrison St., East Orange, N. J.



It Must Cost You Less
to use BESLY-TITAN
Custom-Made
ABRASIVE DISCS and WHEELS!

You'll Get...

- BETTER FINISH
- EASIER CUTTING
- LONGER WHEEL LIFE
- LOWER GRINDING COST

We have proved to leading users of abrasives that we *can* produce custom-made discs and wheels that deliver the results listed above! We'd like to show you, too, that *it MUST cost you less to use Besly-Titan* . . . or no sale!

When you buy Besly-Titan resinoid bonded grinding wheels and discs you get products made to the individual specifications of *your* job. YET YOU *PAY NO MORE* THAN FOR ORDINARY "STOCK" WHEELS, and delivery is just a matter of a few days for these money-saving custom-made products.

Important, too . . . Besly-Titan field engineers work with you on the specifications — to give you *exactly* what you need, not just an approximation of it.

A simple trial will prove to you the savings and improved work you get from *custom-made* Besly-Titan Discs and Wheels on your grinders. Ask us to run one for you.

NEW CATALOG
WRITE NOW to get your free copy of this completely new Abrasive Disc and Wheel Catalog.

BESLY

TAPS—the world's most accurate tap.
TWIST DRILLS AND REAMERS—Complete line for every need.
BESLY-TITAN ABRASIVE WHEELS AND DISCS—individually formulated for your job.
GRINDERS that reduce costs on every type of surface grinding.

CHARLES H. BESLY & COMPANY
• 122 N. CLINTON STREET, CHICAGO 6, ILLINOIS
Factory: Beloit, Wisconsin

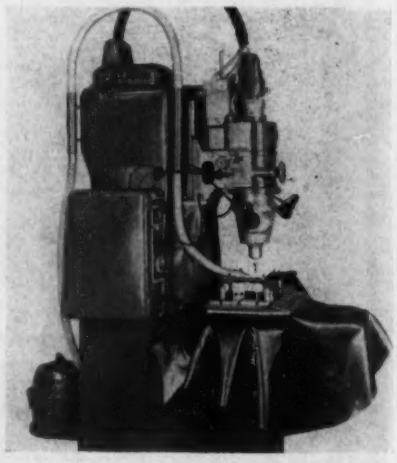
in pre-shaped form include various standard SAE and AISI carbon steels, case hardening steel, standard mild steels and free cutting steels. *A Milne & Co.*

For more data insert No. 32 on postcard, p. 35.

Vacuum Cleaner

Recommended for industrial use as a grinding machine accessory.

The Lewyt vacuum cleaner with its high suction and no-dust-bag feature has been adapted as an accessory on the Moore newest model jig grinder to pick up metal chips. The cleaners are purchased without wands, attachments or containers. A special length of tubing and a



special nozzle, provided by the machine tool company, reaches to the table of the grinder for removal of dust and chips. The cleaner itself is given the same finish as the jig grinder. *Lewyt Corp.*

For more data insert No. 33 on postcard, p. 35.

Rotary Batch Mixer

Offers maximum dust protection; embodies Ransome mixing action.

A dustproof housing encloses the discharge chute of the batch mixer. A sealing disk attached to the inner side of the discharge chute eliminates dust during the mixing period. The units embody the Ransome mixing action where the mixture goes up both sides, falls in two fanlike formations to the bottom, is swished from side to side, carried up again and the operation is repeated. *Worthington Pump & Machinery Corp.*

For more data insert No. 34 on postcard, p. 35.
Resume Your Reading on Page 39

Briefs and Bulletins

new pricing method—The Townsend Co. announces that it is now selling small rivets by the piece instead of by the pound—a departure from an old tradition in the industry. The new price list, with a 50 pct discount, is designed to be the equivalent of the old pound list with 43 pct off. Principal fasteners still being sold by weight include nails, large rivets, and non-ferrous rivets. The company also corrected a few inequities relating to pound pricing.

optimistic ordering—It's beginning to seem as if steel tonnages set aside for the freight car building program in the first quarter of 1951 are too high. Tonnages are based on an expected output of about 10,000 cars a month. October freight car deliveries were 5501, and the American Railway Car Institute says that only a limited rise in monthly deliveries will be possible until March. This indicates that the industry will not be at the 10,000-per-month mark for some time after that.

working balance—Warning that "undue and disproportionate" increases in the stockpile's appetite for critical materials could harm production and employment, the Chamber of Commerce of the United States this week urged the Munitions Board to strike the proper balance between defense and essential civilian needs and the stockpile. The Chamber said stockpiling needs have changed because of the Korean war.

going up?—Steel producers are looking for NPA to order an increase in the set aside for DO orders for February delivery. Reason is that some holders of DO orders are finding it difficult to place orders. At least one big mill is already loaded beyond its quota of flat-rolled DO orders.

subbing specs—Intensive searching is going on in Detroit to find out what can be substituted for nickel, tin, aluminum, copper, etc. The studies are underway, but few changes in specs have been ordered so far. Changes in pistons will probably come last on the list.

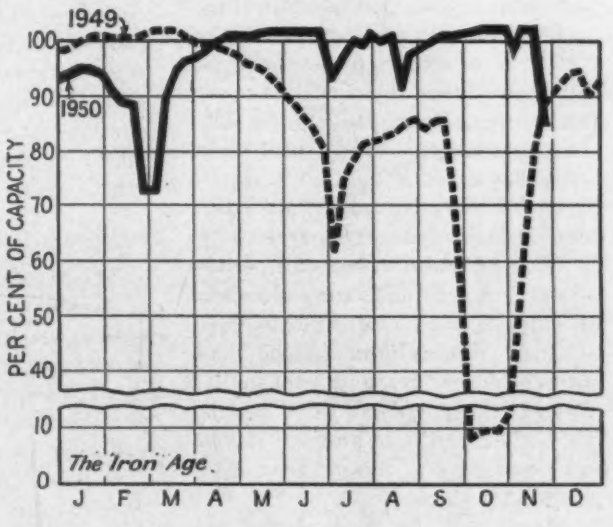
bottleneck—One result of the stepped up plate program has been an easing of cold mill space. At first look this is encouraging to converters. But the catch is that the bottleneck in blooming mills is as tight as ever. Maybe tighter.

lost steel—Because of record snows in the Pittsburgh-Youngstown-Cleveland Area estimated steelmaking operations this week plummeted 18 points from the pre-storm level to a tentative 85 pct of rated capacity. Snow virtually immobilized transport in this area, making it impossible to move raw materials. Loss of close to half a million ingot tons of steel will be another serious blow to manufacturers who have already had their quotas slashed to the bone. Added to this will be tangles in the finishing mills which will be felt for some time.

tinplate—Tennessee Coal, Iron & R. R. Co. tinplate prices are $8.55 for cokes, $7.25 for electrolytic, $6.35 for black plate, and $7.60 for special coated manufacturing ternes. Columbia Steel Co. prices are $9.20 for cokes, $7.90 for electrolytic, and $7.00 for black plate. Carnegie-Illinois prices were announced last week. (THE IRON AGE, Nov. 23, p. 95.)

zinc premium—American Zinc Sales Co. has raised the premium on High Grade and Special High Grade metal by $5 per ton. The increase is effective Jan. 1 and will bring the price of High Grade to 1.35¢ above the Prime Western Zinc and the extra for special High Grade will be 1.50¢ per lb.

Steel Operations**



District Operating Rates—Per Cent of Capacity**

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	West	Buffalo	Cleveland	Detroit	Wheeling	Birmingham	South	St. Louis	East	Aggregate
Nov. 19	80.0*	104.5	93.0*	98.0	101.5	104.0	100.0	103.0	90.0*	106.0	95.5	95.0	128.0	98.0*
Nov. 26	61.0	104.0	42.0	96.0	101.5	104.0	40.0	103.0	70.0	106.0	75.0	90.5	113.0	85.0†

* Revised.
** Steel operations for the first half of 1950 are based on annual capacity of 99,392,800 net tons. Beginning July 1, 1950, operations are based on new annual capacity of 100,563,600 net tons.
†Tentative

Nonferrous Metals OUTLOOK

Market Activities

Reynolds Metals Co. to boost aluminum capacity by 100,000 tons per year . . . Government aid is offered "if necessary" . . . Cadmium price increased 15¢ per lb.

New York—The government's proposed 1 billion lb expansion got underway last week with an agreement between Reynolds Metals Co. and General Services Administration. Under the terms of the agreement, Reynolds is to build a new plant with an annual capacity of 75,000 tons and is to expand its Jones Mill, Ark., plant by 25,000 tons per year.

Government Aid Offered

A GSA spokesman estimated that the new plant will be in production by the first half of 1952 and the new Jones Mill facilities will be operating by "early 1951." The location of the new mill had not been determined at press time.

Government assistance in the form of accelerated depreciation and guaranteed loans will be made available to Reynolds "should they be necessary." The additional 100,000 tons of aluminum is slated to go to the government stockpile and other defense purposes.

GSA is negotiating with other aluminum producers for expansion of existing facilities and construction of new plants. Alcoa has agreed to reactivate its idle facilities at Massena, N. Y., and Badin, N. C. This will add another 79,000 tons annually to the government's aluminum stockpile.

Meanwhile, because of the existing conditions of extreme demand and short supply, the Tariff Commission dismissed applications for investigation made by Reynolds and Kaiser Aluminum & Chemical Corp. earlier this year.

Secondary brass, bronze and aluminum ingots were unchanged in price following a fairly quiet holiday week. Demand, however, continues at a high level.

The Thanksgiving holiday and bad weather also contributed to a relatively quiet week in the scrap metals market. Early this week dealers were worrying over the probable contents of the National Production Authority copper order. The feeling is that rigid controls will force a cutback on scrap copper prices. Because of this feeling, dealers are trying to get rid of as much material as possible so that they will not be caught with a lot of high-priced metal on hand when prices do begin to drop.

Cadmium Price Increases

Effective on Dec. 1, the price of cadmium was raised 15¢ to $2.55 per lb on bars and sticks. Cadmium platers' shapes were also increased 15¢ to a new price of $2.80 per lb. This is the third boost in cadmium prices in 6 months.

Copper Institute reports that fabricators' consumption of copper increased 2600 tons in October to a total of 128,202 tons. Deliveries of metal to the fabricators amounted to 121,806 tons during the month and the products they sold contained 111,757 tons of copper.

Copper Stocks Decline

By the end of October, fabricators' stocks of refined copper had dropped some 7500 tons to 292,563 tons and consumers' working stocks were 289,914. The difference of only 2649 tons is believed to be the smallest supply over plant requirements that has ever been reported by the Copper Institute.

The National Production Authority this week issued a direction which supplements NPA M-7, the aluminum order. It provides four types of adjustments which may be allowed for new businesses, changes in products, seasonal factors, and where the base period was affected by shut-downs of 15 days or more.

NONFERRROUS METALS PRICES

	Nov. 22	Nov. 23	Nov. 24	Nov. 25	Nov. 27	Nov. 28
Copper, electro, Conn.	24.50	24.50	24.50	24.50	24.50	24.50
Copper, Lake, delivered	24.625	24.625	24.625	24.625	24.625	24.625
Tin, Straits, New York	$1.375	....	$1.35	....	$1.315	$1.37*
Zinc, East St. Louis	17.50	17.50	17.50	17.50	17.50	17.50
Lead, St. Louis	16.80	16.80	16.80	16.80	16.80	16.80

Note: Quotations are going prices.

*Tentative.

MILL PRODUCTS

(Cents per lb, unless otherwise noted)

Aluminum

(Base 30,000 lb, f.o.b. ship. pt. frt. allowed)

Flat Sheet: 0.188 in., 2S, 3S, 30.1¢; 4S, 61S-O, 32¢; 52S, 34.1¢; 24S-O, 24S-OAL, 32.9¢; 75S-O, 75S-OAL, 39.9¢; 0.081 in., 2S, 3S, 31.2¢; 4S, 61S-O, 33.5¢; 52S, 35.6¢; 24S-O, 24S-OAL, 34.1¢; 75S-O, 75S-OAL, 41.3¢; 0.032 in., 2S, 3S, 32.9¢; 4S, 61S-O, 37.1¢; 52S, 39.8¢; 24S-O, 24S-OAL, 41.7¢; 75S-O, 75S-OAL, 52.2¢.

Plate: ¼ in. and heavier: 2S, 3S-F, 28.3¢; 4S-F, 30.2¢; 52S-F, 31.8¢; 61S-O, 30.8¢; 24S-O, 24S-OAL, 32.4¢; 75S-O, 75S-OAL, 38.8¢.

Extruded Solid Shapes: Shape factors 1 to 5, 36.2¢ to 74.5¢; 12 to 14, 36.9¢ to 89¢; 24 to 26, 39.6¢ to $1.16; 36 to 38, 47.2¢ to $1.70.

Rod, Rolled: 1.5 to 4.5 in., 2S-F, 3S-F, 37.5¢ to 33.5¢; cold-finished, 0.375 to 3 in., 2S-F, 3S-F, 40.5¢ to 35¢.

Screw Machine Stock: Rounds, 11S-T3, ⅛ to 11/32 in., 53.5¢ to 42¢; ⅜ to 1½ in., 41.5¢ to 39¢; 1 9/16 to 3 in., 38.5¢ to 36¢; 17S-T4 lower by 1.5¢ per lb. Base 5000 lb.

Drawn Wire: Coiled, 0.051 to 0.374 in., 2S, 39.5¢ to 29¢; 52S, 48¢ to 35¢; 56S, 51¢ to 42¢; 17S-T4, 54¢ to 37.5¢; 61S-T4, 48.5¢ to 37¢; 75S-T6, 84¢ to 67.5¢.

Extruded Tubing, Rounds: 63S-T5, OD in in.: 1¼ to 2, 37¢ to 54¢; 2 to 4, 33.5¢ to 45.5¢; 4 to 6, 34¢ to 41.5¢; 6 to 9, 34.5¢ to 43.5¢.

Roofing Sheet, Flat: 0.019 in. x 28 in. per sheet, 72 in., $1.142; 96 in., $1.522; 120 in., $1.902; 144 in., $2.284. Gage 0.024 in. x 28 in., 72 in., $1.379; 96 in., $1.839; 120 in., $2.299; 144 in., $2.759. Coiled Sheet: 0.019 in. x 28 in., 28.2¢ per lb; 0.024 in. x 28 in., 26.9¢ per lb.

Magnesium

(F.o.b. mill, freight allowed)

Sheet and Plate: FS1-O. ¼ in. 63¢; 3/16 in. 65¢; ⅛ in. 67¢; B & S Gage 10, 68¢; 12, 72¢; 14, 78¢; 16, 85¢; 18, 93¢; 20, $1.05; 22, $1.27; 24, $1.67. Specification grade higher. Base: 30,000 lb.

Extruded Round Rod: M, diam in., ¼ to 0.311 in., 74¢; ½ to ¾ in., 57.5¢; 1¼ to 1.749 in., 53¢; 2½ to 5 in., 48.5¢. Other alloys higher. Base: Up to ¾ in. diam, 10,000 lb; ¾ to 2 in., 20,000 lb; 2 in. and larger, 30,000 lb.

Extruded Solid Shapes, Rectangles: M. In weight per ft, for perimeters less than size indicated, 0.10 to 0.11 lb, 3.5 in., 62.3¢; 0.22 to 0.25 lb, 5.9 in., 59.3¢; 0.50 to 0.59 lb, 8.6 in., 56.7¢; 1.8 to 2.59 lb, 19.5 in., 53.3¢; 4 to 6 lb, 28 in., 49¢. Other alloys higher. Base, in weight per ft of shape: Up to ½ lb, 10,000 lb; ½ to 1.80 lb, 29,000 lb; 1.80 lb and heavier, 30,000 lb.

Extruded Round Tubing: M, wall thickness, outside diam, in., 0.049 to 0.057, ¼ in. to 5/16, $1.40; 5/16 to ⅜, $1.26; ½ to ⅝, 93¢; 1 to 2 in., 76¢; 0.165 to 0.219, ⅝ to ¾, 61¢; 1 to 2 in., 57¢; 3 to 4 in., 56¢. Other alloys higher. Base, OD in in.: Up to 1½ in., 10,000 lb; 1½ in. to 3 in., 20,000 lb; 3 in. and larger, 30,000 lb.

Titanium

(10,000 base, f.o.b. mill)

Commercially pure and alloy grades: Sheet and strip, HR or CR, $15; Plate, HR, $12; Wire, rolled and/or drawn, $10; Bar, HR or forged, $6; Forgings, $6.

Nickel and Monel

(Base prices, f.o.b. mill)

	"A" Nickel	Monel
Sheets, cold-rolled	69	53
Strip, cold-rolled	75	56
Rods and bars	65	51
Angles, hot-rolled	65	51
Plates	67	52
Seamless tubes	98	86
Shot and blocks	..	46

Copper, Brass, Bronze

(Freight prepaid on 200 lb includes duty)

	Sheets	Rods	Extruded Shapes
Copper	41.03	....	40.63
Copper, h-r	....	36.88	....
Copper, drawn	....	38.18	....
Low brass	39.15	38.84	....
Yellow brass	38.28	37.97	....
Red brass	40.14	39.83	....
Naval brass	43.08	38.61	38.07
Leaded brass	....	32.63	36.70
Com'l bronze	41.13	40.82	....
Mang. bronze	45.96	40.65	41.41
Phos. bronze	60.20	60.45	....
Munts metal	40.43	36.74	37.39
Ni silver, 10 pct	49.27	51.49	....
Arch. bronze	....	....	35.11

PRIMARY METALS

(Cents per lb, unless otherwise noted)

Aluminum ingot, 99+%, 10,000 lb, freight allowed	19.00
Aluminum pig	18.00
Antimony, American, Laredo, Tex.	32.00
Beryllium copper, 3.75-4.25% Be	$1.56
Beryllium aluminum 5% Be, dollars per lb contained Be	$69.00
Bismuth, ton lots	$2.25
Cadmium, del'd	$2.55
Cobalt, 97-99% (per lb)	$1.80 to $1.87
Copper, electro, Conn. Valley	24.50
Copper, Lake, delivered	24.625
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$200
Lead, St. Louis	16.80
Lead, New York	17.00
Magnesium, 99.8+%, f.o.b. Freeport, Tex., 10,000 lb	24.50
Magnesium, sticks, 100 to 500 lb	42.00 to 44.00
Mercury, dollars per 76-lb flask f.o.b. New York	$100 to $110
Nickel, electro, f.o.b. New York	51.22
Nickel oxide sinter, f.o.b. Copper Cliff, Ont., contained nickel	44.25
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per troy oz.	$90 to $93
Silver, New York, cents per oz.	80.00
Tin, New York	$1.37
Titanium, sponge	$5.00
Zinc, East St. Louis	17.50
Zinc, New York	18.22
Zirconium copper, 50 pct	$6.20

REMELTED METALS

Brass Ingot

(Cents per lb delivered, carloads)

85-5-5-5 ingot	
No. 115	29.00
No. 120	28.50
No. 123	28.00
80-10-10 ingot	
No. 305	35.00
No. 315	32.00
88-10-2 ingot	
No. 210	47.50
No. 215	44.50
No. 245	37.00
Yellow ingot	
No. 405	25.50
Manganese bronze	
No. 421	32.75

Aluminum Ingot

(Cents per lb, 30,000 lb lots)

95-5 aluminum-silicon alloys	
0.30 copper, max.	33.75-34.25
0.60 copper, max.	33.50-34.00
Piston alloys (No. 122 type)	31.50-32.00
No. 12 alum. (No. 2 grade)	30.75-31.25
108 alloy	31.25-31.75
195 alloy	32.75-33.25
13 alloy	34.00-34.50
AXS-679	31.25-31.75

Steel deoxidizing aluminum, notch-bar granulated or shot

Grade 1—95-97½%	32.50-33.00
Grade 2—92-95%	30.75-31.50
Grade 3—90-92%	30.00-30.50
Grade 4—85-90%	29.50-30.00

ELECTROPLATING SUPPLIES

Anodes

(Cents per lb, freight allowed, 500 lb lots)

Copper	
Cast, oval, 15 in. or longer	39½
Electrodeposited	33⅝
Rolled, oval, straight, delivered	38⅞
Forged ball anodes	43
Brass, 80-20	
Cast, oval, 15 in. or longer	34¾
Zinc, oval	26½
Ball anodes	25½
Nickel 99 pct plus	
Cast	68.00
Rolled, depolarized	69.00
Cadmium	$2.80
Silver 999 fine, rolled, 100 oz lots, per troy oz, f.o.b. Bridgeport, Conn.	79½

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 100 lb drum	52.15
Copper sulfate, 99.5 crystals, bbl.	12.85
Nickel salts, single or double, 4-100 lb bags, frt allowed	20½
Nickel chloride, 375 lb drum	27½
Silver cyanide, 100 oz lots, per oz	61¼
Sodium cyanide, 96 pct domestic 200 lb drums	19.25
Zinc cyanide, 100 lb drums	45.85

SCRAP METALS

Brass Mill Scrap

(Cents per pound, add ½¢ per lb for shipments of 20,000 to 40,000 lb; add 1¢ for more than 40,000 lb)

	Heavy	Turnings
Copper	23	22¼
Yellow brass	20½	18¾
Red brass	21½	20¾
Comm. bronze	21¾	21
Mang. bronze	19½	18⅝
Brass rod ends	19⅞	....

Custom Smelters' Scrap

(Cents per pound, carload lots, delivered to refinery)

No. 1 copper wire	21.75
No. 2 copper wire	20.75
Light copper	19.75
Refinery brass	21.00*
Radiators	17.50

*Dry copper content.

Ingot Makers' Scrap

(Cents per pound, carload lots, delivered to producer)

No. 1 copper wire	21.75
No. 2 copper wire	20.75
Light copper	19.75
No. 1 composition	22.50
No. 1 comp. turnings	22.25
Rolled brass	19.00
Brass pipe	21.00
Radiators	17.75
Heavy yellow brass	17.50
Aluminum	
Mixed old cast	20
Mixed old clips	21
Mixed turnings, dry	19½
Pots and pans	20
Low copper	22½

Dealers' Scrap

(Dealers' buying prices, f.o.b. New York in cents per pound)

Copper and Brass	
No. 1 heavy copper and wire	24½—25
No. 2 heavy copper and wire	22½—23
Light copper	21 —21½
New type shell cuttings	21 —21½
Auto radiators (unsweated)	15½—15½
No. 1 composition	18¾—19
No. 1 composition turnings	18¼—18½
Clean red car boxes	16¾—17
Cocks and faucets	16¾—17
Mixed heavy yellow brass	13½—14
Old rolled brass	15 —15½
Brass pipe	17¾—18
New soft brass clippings	18½—19
Brass rod ends	17½—18
No. 1 brass rod turnings	17 —17½
Aluminum	
Alum. pistons and struts	12½—13
Aluminum crankcases	15½—16
2S aluminum clippings	19 —19½
Old sheet and utensils	15½—16
Borings and turnings	13
Misc. cast aluminum	15½—16
Dural clips (24S)	15½—16
Zinc	
New zinc clippings	14½—15
Old zinc	11¼—11½
Zinc routings	8½— 9
Old die cast scrap	8¾— 8¾
Nickel and Monel	
Pure nickel clippings	60 —65
Clean nickel turnings	57 —60
Nickel anodes	60 —65
Nickel rod ends	60 —65
New Monel clippings	22 —25
Clean Monel turnings	18 —20
Old sheet Monel	20 —22
Inconel clippings	26 —28
Nickel silver clippings, mixed	13 —14
Nickel silver turnings, mixed	12 —13
Lead	
Soft scrap, lead	14¼—14¾
Battery plates (dry)	8¾— 9
Magnesium	
Segregated solids	9 —10
Castings	5½— 6½
Miscellaneous	
Block tin	85 —90
No. 1 pewter	63 —65
No. 1 auto babbitt	58 —60
Mixed common babbitt	13½—14
Solder joints	18½—19
Siphon tops	58 —60
Small foundry type	16½—17
Monotype	15½—16
Lino. and stereotype	14½—15
Electrotype	13¼—13¾
Hand picked type shells	11½—11¾
Lino. and stereo. dross	8 — 8¼
Electro. dross	6½— 6¾

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MARKETS—PRICES—TRENDS

SCRAP
Iron & Steel

Snow Subdues Market Price Activity

The now famous blizzard and wind storm that lashed over steelmaking centers snarled up scrap shipments for a while. Since the after effects of the storm will hamper scrap collection, it may work against some consumers who have been having difficulty in getting scrap at formula prices.

With the exception of St. Louis and Detroit, markets were subdued pricewise but this meant that the pressure had only been checked momentarily. The trade in Pittsburgh is looking for a No. 1 formula price revision after announcement of higher steel prices.

Chicago scrap circles are awaiting the entry of a heavy scrap consumer into the market next week and some opine the formula won't be able to take it. Detroit scrap lists for December are expected to continue at formula. In snowbound Cleveland, the formula held, bolstered by the reported sale of 20,000 tons at $44—plus springboards. No. 1 heavy in St. Louis moved $1.

PITTSBURGH—The worst snow storm in Pittsburgh district history virtually halted movement of scrap to area mills. A prolonged tieup would prove serious to some producers who had been finding it difficult to get scrap at formula before the storm struck. The trade looks for an upward revision of formula price on No. 1 heavy melting within the next several weeks, probably after announcement of higher finished steel prices. No. 2 heavy melting and No. 2 bundles already are bringing $44, although they are tagged as No. 1 heavy melting on orders. Genuine No. 1 is bringing the low phos formula of $46.50.

CHICAGO—The situation here may be cleared up next week when a major consumer is expected to enter the scrap market. Informed sources believe the formula won't hold. Brokers are reported offering $3 to $4 over formula prices for openhearth grades. Some brokers, having filled old orders, have stopped buying until they can get a better idea of what the new price, if any, will be. No. 1 machinery cast is all over the lot and has been sold for as much as $65, although the majority of cast is not moving at these prices.

PHILADELPHIA—The market is quiet this week with the only increase being a $1 rise in No. 1 machinery cast to a range of $56 to $57. More orders have been taken for steel grades at the formula level and material is flowing to the mills in fair quantity. However, the mills are not getting as much scrap as they would like. There is a feeling that wintry weather will force some prices higher.

NEW YORK—Demand for scrap of all grades did not lose any of its underlying potency but was temporarily sidetracked by the storm. Prices remained unchanged but the trade waited cautiously for business-as-usual to return. Some sources are waiting for the market to show much higher activity soon.

DETROIT—For the first time in several months, the price trend in the Detroit market is mixed. While demand for bundles and other electric furnace grades is stronger than last week, recent shipments of foundry scrap into this area, particularly from the South, have forced an easing of cast iron prices. While no runaway, this trend appears to be gaining. Meanwhile, December scrap lists are expected again to go at formula prices and steel mills are reported extending their influence over scrap to cover more small plants and dealers.

CLEVELAND—A strong scrap market here and in the Valley was paralyzed this week by the tremendous snow which cut steelmaking operations to the bone. Despite snow, formula prices were holding, backed by the reported purchase of 20,000 tons at $44, plus applicable springboards, by a major consumer. Including springboards some of this tonnage probably cost $48. Foundry grades are strong. Mills will probably resume full scale operations before scrap yards.

ST. LOUIS—The spotlight turns again on melting grades of scrap iron No. 1 advancing $1 and No. 2 advancing $3. The advances followed new contracts of a nearby melter, retroactive to Nov. 1, which have been met by one district mill. Brokers are bullish on reports that there would be no price controls on scrap.

CINCINNATI—Pricewise the market here is clarifying despite a terrific snow which immobilized yard operations and collections. No. 1 heavy melting steel is being sold to outside markets at $1 to $2 over the formula and a sale of tonnage of No. 1 to a district mill at $44.50 was reported. Confirmation was lacking, however. A tonnage of railroad heavy melting brought $50, part of which went to a nearby market.

BOSTON—Market activity is quieter here. Although the formula for No. 1 heavy melting steel remained at $32.50, scattered sales were reported ranging up to $36 a ton. The formula also stood up for No. 1 busheling but good heavy material is bringing higher prices.

BIRMINGHAM—Scrap prices remained steady this week, with little trading. Dealers and brokers report very little scrap is moving into the district. Buyers from other areas are able to offer more for scrap because of price resistance here. One cast-iron pipe manufacturer was reported paying $60 for No. 1 cast.

BUFFALO—Strength and hints of higher prices in cast featured the scrap market during the week. Talk was heard of new business pending in cast at higher levels. Dealers reported no change in steelmaking items. Shipments continue against old orders placed by top mill consumers at formula prices. However, business was also on the books to smaller users above the formula. Scrap from outlying sections which usually moves here is reported going elsewhere because of better price inducements.

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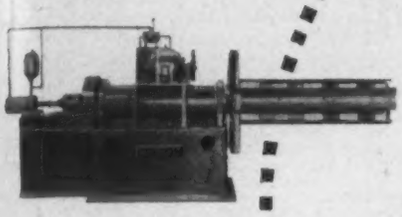
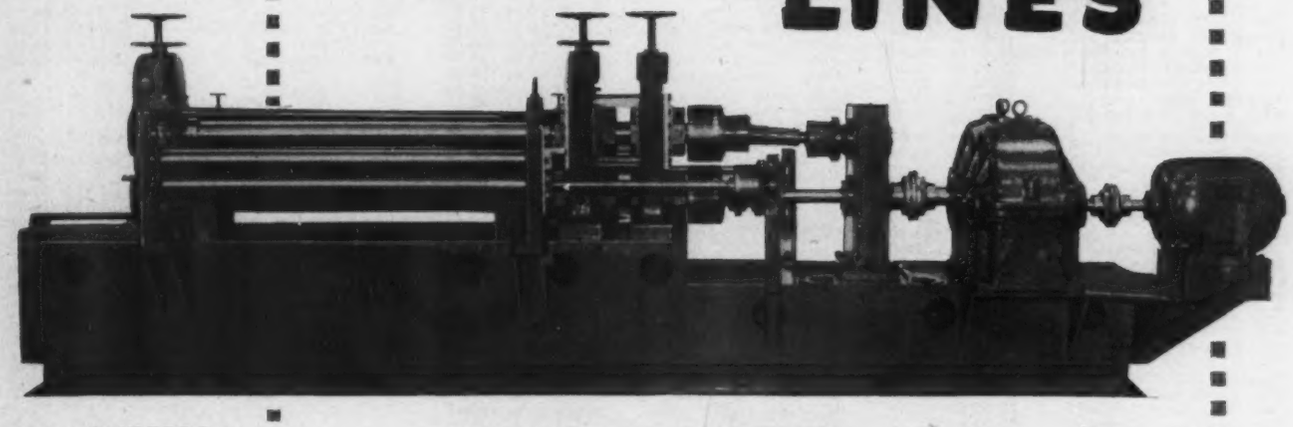


PAY-OFF REELS



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Iron and Steel

SCRAP PRICES

Going prices as obtained in the trade by THE IRON AGE, based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Pittsburgh

No. 1 hvy. melting	$43.50 to $44.00
No. 2 hvy. melting	40.50 to 41.00
No. 1 bundles	46.00 to 46.50
No. 2 bundles	38.50 to 39.00
Machine shop turn.	35.50 to 36.00
Mixed bor. and ms. turns.	35.50 to 36.00
Shoveling turnings	37.50 to 38.00
Cast iron borings	37.00 to 37.50
Low phos. plate	53.50 to 54.00
Heavy turnings	46.00 to 46.50
No. 1 RR. hvy. melting	44.00 to 45.00
Scrap rails, random lgth.	63.00 to 63.50
Rails 2 ft and under	67.00 to 68.00
RR. steel wheels	61.00 to 62.00
RR. spring steel	61.00 to 62.00
RR. couplers and knuckles	61.00 to 62.00
No. 1 machinery cast	60.50 to 61.00
Mixed yard cast.	54.50 to 55.00
Heavy breakable cast	51.50 to 52.00
Malleable	68.00 to 70.00

Chicago

No. 1 hvy. melting	$39.50 to $40.00
No. 2 hvy. melting	37.50 to 38.00
No. 1 factory bundles	39.50 to 40.00
No. 1 dealers' bundles	39.50 to 40.00
No. 2 dealers' bundles	34.00 to 35.00
Machine shop turn.	34.50 to 35.00
Mixed bor. and turn.	34.50 to 35.00
Shoveling turnings	35.00 to 36.00
Cast iron borings	35.00 to 36.00
Low phos. forge crops	55.00 to 57.00
Low phos. plate	52.00 to 54.00
No. 1 RR. hvy. melting	46.50 to 47.50
Scrap rails, random lgth.	59.00 to 60.00
Rerolling rails	63.00 to 66.00
Rails 2 ft and under	65.50 to 66.50
Locomotive tires, cut	57.00 to 58.00
Cut bolsters & side frames	54.00 to 55.00
Angles and splice bars	62.00 to 63.00
RR. steel car axles	95.00 to 100.00
RR. couplers and knuckles	57.00 to 58.00
No. 1 machinery cast.	61.00 to 63.00
No. 1 agricul. cast.	56.00 to 57.00
Heavy breakable cast.	52.00 to 53.00
RR. grate bars	46.00 to 47.00
Cast iron brake shoes	48.50 to 49.50
Cast iron car wheels	56.00 to 57.00
Malleable	71.00 to 72.00

Philadelphia

No. 1 hvy. melting	$38.50 to $39.00
No. 2 hvy. melting	35.00 to 36.00
No. 1 bundles	38.50 to 39.00
No. 2 bundles	31.00 to 32.00
Machine shop turn.	29.00 to 30.00
Mixed bor. and turn.	26.00 to 27.00
Shoveling turnings	32.00 to 33.00
Low phos. punchings, plate	49.00 to 50.00
Low phos. 5 ft and under	48.00 to 49.00
Low phos. bundles	45.00 to 46.00
Hvy. axle forge turn.	38.50 to 39.00
Clean cast chem. borings	41.00 to 42.00
RR. steel wheels	53.00 to 54.00
RR. spring steel	53.00 to 54.00
Rails 18 in. and under	66.00 to 67.00
No. 1 machinery cast.	56.00 to 57.00
Mixed yard cast.	49.00 to 51.00
Heavy breakable cast.	49.00 to 50.00
Cast iron carwheels	62.00 to 63.00
Malleable	65.00 to 67.00

Cleveland

No. 1 hvy. melting	$43.00 to $43.50
No. 2 hvy. melting	40.00 to 40.50
No. 1 busheling	43.00 to 43.50
No. 1 bundles	43.00 to 43.50
No. 2 bundles	28.00 to 28.50
Machine shop turn.	35.00 to 35.50
Mixed bor. and turn.	36.00 to 36.50
Shoveling turnings	37.00 to 37.50
Cast iron borings	37.00 to 37.50
Low phos. 2 ft and under	45.50 to 46.00
Steel axle turn.	43.00 to 43.50
Drop forge flashings	45.00 to 45.50
No. 1 RR. hvy. melting	43.50 to 44.00
Rails 3 ft and under	69.00 to 70.00
Rails 18 in. and under	70.00 to 71.00
No. 1 machinery cast.	64.00 to 65.00
RR. cast.	64.50 to 65.00
RR. grate bars	46.00 to 47.00
Stove plate	51.00 to 52.00
Malleable	69.00 to 70.00

Youngstown

No. 1 hvy. melting	$43.50 to $44.00
No. 2 hvy. melting	40.50 to 41.00
No. 1 bundles	43.50 to 44.00
No. 2 bundles	43.50 to 44.00
Machine shop turn.	35.50 to 36.00
Mixed bor. and turn.	35.50 to 36.00
Shoveling turnings	37.50 to 38.00
Cast iron borings	37.50 to 38.00
Low phos. plate	46.00 to 46.50

Buffalo

No. 1 hvy. melting	$41.00 to $42.00
No. 2 hvy. melting	37.50 to 38.50
No. 1 busheling	37.50 to 38.50
No. 1 bundles	39.50 to 40.00
No. 2 bundles	36.00 to 36.50
Machine shop turn.	32.00 to 33.00
Mixed bor. and turn.	35.00 to 36.00
Shoveling turnings	35.00 to 36.00
Cast iron borings	35.00 to 36.00
Low phos. plate	46.00 to 47.00
Scrap rails, random lgth.	52.00 to 53.00
Rails 2 ft and under	59.00 to 61.00
RR. steel wheels	52.00 to 53.00
RR. spring steel	52.00 to 53.00
RR. couplers and knuckles	52.00 to 53.00
No. 1 machinery cast.	52.00 to 54.00
No. 1 cupola cast.	49.00 to 50.00
Small indus. malleable	60.00 to 62.00

Birmingham

No. 1 hvy. melting	$37.00 to $38.00
No. 2 hvy. melting	33.00 to 34.00
No. 2 bundles	31.00 to 32.00
No. 1 busheling	36.00 to 37.00
Machine shop turn.	29.00 to 30.00
Shoveling turnings	30.00 to 31.00
Cast iron borings	25.00 to 26.00
Bar crops and plate	44.00 to 45.00
Structural and plate	44.00 to 45.00
No. 1 RR. hvy. melting	41.00 to 42.00
Scrap rails, random lgth.	56.00 to 57.00
Rerolling rails	59.00 to 60.00
Rails 2 ft and under	64.00 to 65.00
Angles & splice bars	59.00 to 60.00
Std. steel axles	61.00 to 62.00
No. 1 cupola cast.	59.00 to 60.00
Stove plate	53.00 to 54.00
Cast iron carwheels	46.00 to 47.00

St. Louis

No. 1 hvy. melting	$43.00 to $45.00
No. 2 hvy. melting	39.00 to 41.00
No. 2 bundled sheets	38.00 to 39.00
Machine shop turn.	29.50 to 30.50
Shoveling turnings	32.00 to 33.00
Rails, random lengths	55.00 to 57.00
Rails 3 ft and under	63.00 to 65.00
Locomotive tires, uncut	53.00 to 54.00
Angles and splice bars	60.00 to 62.00
Std. steel car axles	90.00 to 95.00
RR. spring steel	55.00 to 57.00
No. 1 machinery cast.	60.00 to 62.00
Hvy. breakable cast.	49.00 to 51.00
Cast iron brake shoes	49.00 to 50.00
Stove plate	46.00 to 47.00
Cast iron car wheels	60.00 to 62.00
Malleable	65.00 to 66.00

New York

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$34.50
No. 2 hvy. melting	$29.00 to 30.00
No. 2 bundles	28.50 to 29.00
Machine shop turn.	25.50 to 26.00
Mixed bor. and turn.	25.50 to 26.00
Shoveling turnings	27.50 to 28.00
Clean cast chem. bor.	34.50 to 35.50
No. 1 machinery cast.	48.00 to 49.00
Mixed yard cast.	43.00 to 44.00
Charging box cast.	43.00 to 44.00
Heavy breakable cast.	43.00 to 44.00
Unstrp. motor blocks	38.00 to 39.00

Boston

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$32.50
No. 2 hvy. melting	$29.50 to 29.92
No. 1 bundles	35.00 to 36.00
No. 2 bundles	$28.00 to $29.00
Machine shop turn.	24.50 to 25.00
Mixed bor. and turn.	24.00 to 24.50
Shoveling turnings	26.00 to 26.50
No. 1 busheling	34.92
Clean cast chem. borings	30.00 to 31.00
No. 1 machinery cast.	46.00 to 47.00
Mixed cupola cast.	41.00 to 42.00
Heavy breakable cast.	39.00 to 40.00
Stove plate	39.50 to 40.50

Detroit

Brokers' buying prices per gross ton, on cars

No. 1 hvy. melting	$37.50 to $41.50
No. 2 hvy. melting	32.50 to 37.00
No. 1 bundles	37.50 to 45.00
New busheling	37.50 to 43.00
Flashings	37.00 to 37.50
Machine shop turn.	29.00 to 29.50
Mixed bor. and turn.	29.00 to 29.50
Shoveling turnings	31.50 to 34.00
Cast iron borings	31.50 to 34.00
Low phos. plate	40.00 to 45.00
No. 1 cupola cast.	58.00 to 60.00
Heavy breakable cast.	49.00 to 51.00
Stove plate	48.00 to 50.00
Automotive cast.	62.00 to 64.00

Cincinnati

Per gross ton, f.o.b. cars:

No. 1 hvy. melting	$42.00 to $42.50
No. 2 hvy. melting	39.00 to 39.50
No. 1 bundles	42.00 to 42.50
No. 2 bundles, black	39.00 to 39.50
No. 2 bundles, mixed	32.50 to 33.00
Machine shop turn.	28.50 to 29.00
Mixed bor. and turn.	30.50 to 31.00
Shoveling turnings	31.50 to 32.00
Cast iron borings	31.50 to 32.00
Low phos. 18 in. under	55.00 to 56.00
Rails, random lengths	62.00 to 63.00
Rails, 18 in. and under	69.00 to 70.00
No. 1 cupola cast.	64.00 to 65.00
Hvy. breakable cast.	51.00 to 52.00
Drop broken cast.	66.00 to 67.00

San Francisco

No. 1 hvy. melting	$30.00
No. 2 hvy. melting	28.00
No. 1 bundles	30.00
No. 2 bundles	28.00
No. 3 bundles	25.00
Machine shop turn.	16.00
Elec. fur. 1 ft and under	$40.00 to 42.00
No. 1 RR. hvy. melting	30.00
Scrap rails random lgth.	30.00
No. 1 cupola cast.	43.00 to 46.00

Los Angeles

No. 1 hvy. melting	$30.00
No. 2 hvy. melting	28.00
No. 1 bundles	30.00
No. 2 bundles	28.00
No. 3 bundles	25.00
Mach. shop turn.	16.00
Elec. fur. 1 ft and under	$42.00 to 45.00
No. 1 RR. hvy. melting	30.00
Scrap rails, random lgth.	30.00
No. 1 cupola cast.	48.00 to 50.00

Seattle

No. 1 hvy. melting	$24.00 to $28.00
No. 2 hvy. melting	24.00 to 28.00
No. 1 bundles	22.00
No. 2 bundles	22.00
No. 3 bundles	18.00
Elec. fur. 1 ft and under	$29.00 to 30.00
RR. hvy. melting	25.00
No. 1 cupola cast	35.00
Heavy breakable cast.	35.00

Hamilton, Ont.

No. 1 hvy. melting	$30.00
No. 1 bundles	30.00
No. 2 bundles	29.50
Mechanical bundles	28.00
Mixed steel scrap	26.00
Mixed bor. and turn.	23.00
Rails, remelting	30.00
Rails, rerolling	33.00
Bushelings	24.50
Bush., new fact, prep'd.	29.00
Bush., new fact, unprep'd.	23.00
Short steel turnings	23.00
Cast scrap	45.00

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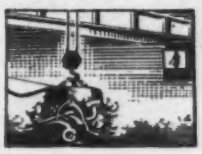

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LEADERS IN IRON AND STEEL SCRAP SINCE 1889

Comparison of Prices

Steel prices in this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Flat Rolled Steel: (cents per pound)	Nov. 28, 1950	Nov. 21, 1950	Oct. 31, 1950	Nov. 29 1949
Hot-rolled sheets	3.35	3.35	3.35	3.25
Cold-rolled sheets	4.10	4.10	4.10	4.00
Galvanied sheets (10 ga)	4.40	4.40	4.40	4.40
Hot-rolled strip	3.25	3.25	3.25	3.25
Cold-rolled strip	4.21	4.21	4.21	4.038
Plate	3.50	3.50	3.50	3.40
Plates wrought iron	7.85	7.85	7.85	7.85
Stains C-R-strip (No. 302)	34.50	34.50	34.50	33.00
Tin and Terneplate: (dollars per base box)				
Tinplate (1.50 lb) cokes.	$7.50	$7.50	$7.50	$7.75
Tinplate, electro (0.50 lb)	6.60	6.60	6.60	6.70
Special coated mfg. ternes	6.35	6.35	6.35	6.65
Bars and Shapes: (cents per pound)				
Merchant bars	3.45	3.45	3.45	3.35
Cold finished bars	4.15	4.15	4.15	3.995
Alloy bars	3.95	3.95	3.95	3.75
Structural shapes	3.40	3.40	3.40	3.25
Stainless bars (No. 302)	30.00	30.00	30.00	28.50
Wrought iron bars	9.50	9.50	9.50	9.50
Wire: (cents per pound)				
Bright wire	4.50	4.50	4.50	4.15
Rails: (dollars per 100 lb)				
Heavy rails	$3.40	$3.40	$3.40	$3.20
Light rails	3.75	3.75	3.75	3.55
Semifinished Steel: (dollars per net ton)				
Rerolling billets	$54.00	$54.00	$54.00	$52.00
Slabs, rerolling	54.00	54.00	54.00	52.00
Forging billets	63.00	63.00	63.00	61.00
Alloy blooms, billets, slabs	66.00	66.00	66.00	63.00
Wire Rod and Skelp: (cents per pound)				
Wire rods	3.85	3.85	3.85	3.40
Skelp	3.15	3.15	3.15	3.25

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*

Pig Iron: (per gross ton)	Nov. 28, 1950	Nov. 21, 1950	Oct. 31, 1950	Nov. 29 1949
No. 2, foundry, del'd Phila.	$54.77	$54.77	$52.77	$50.42
No. 2, Valley furnace	49.50	49.50	49.50	46.50
No. 2, Southern Cin'ti	52.58	52.58	52.58	46.08
No. 2, Birmingham	45.88	45.88	45.88	39.38
No. 2, foundry, Chicago†	49.50	49.50	49.50	46.50
Basic del'd Philadelphia	53.92	53.92	51.92	49.92
Basic, Valley furnace	49.00	49.00	49.00	46.00
Malleable, Chicago†	49.50	49.50	49.50	46.50
Malleable, Valley	49.50	49.50	49.50	46.50
Charcoal, Chicago	70.56	70.56	70.56	68.56
Ferromanganese‡	181.20	181.20	173.40	173.40

†The switching charge for delivery to foundries in the Chicago district is $1 per ton.
‡Average of U. S. prices quoted on Ferroalloy page.

Scrap: (per gross ton)	Nov. 28, 1950	Nov. 21, 1950	Oct. 31, 1950	Nov. 29 1949
Heavy melt'g steel, P'gh.	$43.75	$43.75	$43.75	$31.75
Heavy melt'g steel, Phila.	38.75	38.75	38.50	25.50
Heavy melt'g steel, Ch'go	39.75	39.75	39.75	29.50
No. 1 hy. com. sh't, Det.	41.25	41.25	37.25	29.50
Low phos. Young'n	46.25	46.25	46.25	33.75
No. 1 cast, Pittsburgh	60.75	60.75	57.75	39.50
No. 1 cast, Philadelphia	56.50	55.50	53.50	38.00
No. 1 cast, Chicago	62.00	61.50	57.00	44.50
Coke: Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.25	$14.25	$14.25	$14.00
Foundry coke, prompt	16.75	16.75	16.75	15.75
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro, Conn.	24.50	24.50	24.50	18.50
Copper, Lake, Conn.	24.625	24.625	24.625	18.625
Tin Straits, New York	*$1.37*†	$1.44*	$1.26	85.00
Zinc, East St. Louis	17.50	17.50	17.50	9.75
Lead, St. Louis	16.80	16.80	15.80	11.80
Aluminum, virgin	19.00	19.00	19.00	17.00
Nickel, electrolytic	51.22	51.22	51.22	42.97
Magnesium, ingot	24.50	24.50	24.50	20.50
Antimony, Laredo, Tex.	32.00	32.00	32.00	32.00

†Tentative. *Revised.

Composite Prices

Starting with the issue of May 12, 1949, the weighted finished steel composite was revised for the years 1941 to date. The weights used are based on the average product shipments for the 7 years 1937 to 1940 inclusive and 1946 to 1948 inclusive. The use of quarterly figures has been eliminated because it was too sensitive. (See p. 130 of May 12, 1949, issue.)

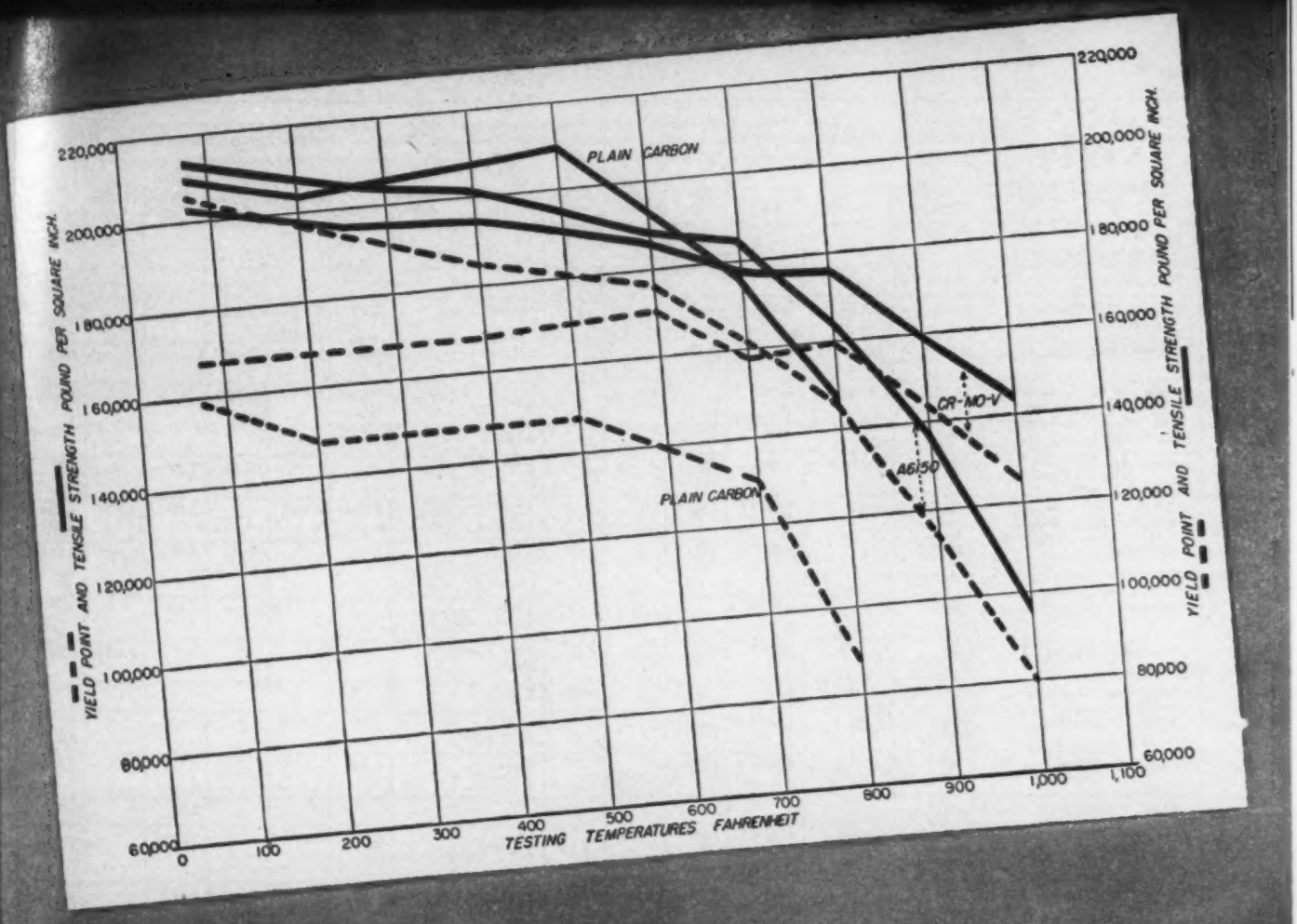
	Finished Steel Base Price	Pig Iron	Scrap Steel
Nov. 28, 1950	3.837¢ per lb.	$49.69 per gross ton	$40.75 per gross ton
One week ago	3.837¢ per lb.	49.69 per gross ton	40.75 per gross ton
One month ago	3.837¢ per lb.	49.36 per gross ton	40.67 per gross ton
One year ago	3.705¢ per lb.	45.88 per gross ton	28.92 per gross ton

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Scrap Steel High	Scrap Steel Low
1950	3.837¢ Jan. 3	3.837¢ Jan. 3	$49.69 Nov. 7	$45.88 Jan. 3	$41.67 Nov. 7	$26.25 Jan. 3
1949	3.837¢ Dec. 27	3.3705¢ May 3	46.87 Jan. 18	45.88 Sept. 6	43.00 Jan. 4	19.33 June 28
1948	3.721¢ July 27	3.193¢ Jan. 1	46.91 Oct. 12	39.58 Jan. 6	43.16 July 27	39.75 Mar. 9
1947	3.193¢ July 29	2.848¢ Jan. 1	37.98 Dec. 30	30.14 Jan. 7	42.58 Oct. 28	29.50 May 20
1946	2.848¢ Dec. 31	2.464¢ Jar. 1	30.14 Dec. 10	25.37 Jan. 1	31.17 Dec. 24	19.17 Jan. 1
1945	2.464¢ May 29	2.396¢ Jan. 1	25.37 Oct. 23	23.61 Jan. 2	19.17 Jan. 2	18.92 May 22
1944	2.396¢	2.396¢	$23.61	$23.61	19.17 Jan. 11	15.76 Oct. 24
1943	2.396¢	2.396¢	23.61	23.61	$19.17	$19.17
1942	2.396¢	2.396¢	23.61	23.61	19.17	19.17
1941	2.396¢	2.396¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	32.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 9
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 8
1935	2.07542¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1932	1.89196¢ July 5	1.83910¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 8

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strips, representing major portion of finished steel shipment. Index recapitulated in Aug. 28, 1941, issue and in May 12, 1949.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Average of No. 1 heavy melting steel scrap delivered to consumers at Pittsburgh, Philadelphia and Chicago.



HIGH TEMPERATURE PROPERTIES

of Cr-V and Cr-Mo-V Spring Steels

SPRINGS FOR SERVICE at elevated temperatures require steels which resist softening and lowering of the yield point. Unless hardness and yield strength are stabilized by correct alloy additions to the steel, these properties deteriorate rapidly as the temperature is raised.

The chart above shows the yield point and tensile strength of three types of spring steel at elevated temperatures determined by standard short-time tension tests.

Springs of plain carbon steel are sometimes used at moderately elevated temperatures, although their lower yield values prevent them from giving service as satisfactory as that of the alloy spring steels.

Chromium-vanadium steel springs, such as AISI 6150, give better service at ordinary temperatures because of the higher yield point. In addition, they may be used at operating temperatures up to about 700° or 750° F because they retain high yield point values as the temperature is increased.

Chromium-molybdenum-vanadium steel was especially designed for springs operating at temperatures in excess of 750° F. It can be used for springs operating at temperatures as high as 850° F or even higher under some conditions. At 800° F, the yield point of this steel is still greater than that of plain carbon steel at room temperature.

If you have a problem in spring applications at elevated temperatures, our metallurgical engineers will be glad to help you solve it.

MAKERS OF ALLOYS — VANCORAM — CHEMICALS AND METALS

VANADIUM CORPORATION OF AMERICA

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • DETROIT • CHICAGO • CLEVELAND • PITTSBURGH

STEEL PRICES

Smaller numbers in price boxes indicate producing companies. For main office locations, see key on facing page.
Base prices at producing points apply only to sizes and grades produced in these areas. Prices are in cents per lb unless otherwise noted. Extras apply.

	Pittsburgh	Chicago	Gary	Cleveland	Canton Massillon	Middletown	Youngstown	Bethlehem	Buffalo	Conshohocken	Johnstown	Sparrows Point	Granite City	Detroit
INGOTS Carbon forging, net ton	$50.00[1]													$50.00[31]
Alloy, net ton	$51.00[1,17]													$51.00[31]
BILLETS, BLOOMS, SLABS Carbon, rerolling, net ton	$53.00[1]	$53.00[1]	$53.00[1]				$57.00[13]		$53.00[3]	$62.00[26]	$53.00[3]			
Carbon forging billets, net ton	$63.00[1]	$63.00[1,4]	$63.00[1,3]	$63.00[4]			$63.00[28]		$63.00[3], 4	$68.00[26]	$63.00[3]			$68.00[31]
Alloy, net ton	$66.00[1,17]	$66.00[1,4]	$66.00[1]		$66.00[4], 42			$66.00[3]	$66.00[3], 4	$70.00[26]	$66.00[3]			$69.00[31]
PIPE SKELP	3.15[1]						3.15[1,4]							
WIRE RODS	3.85[3] 4.05[18]	3.85[3,4,33]	3.85[3]	3.85[3]			3.85[3]				3.85[3]	3.95[3]		
SHEETS Hot-rolled (18 ga. & hvr.)	3.35[1,5,9,15]	3.35[33]	3.35[1,4,5]	3.35[4,5]			3.35[1,4,6] 3.75[13]		3.35[3]	3.60[26]		3.35[3]	4.05[33]	3.55[12] 4.15[47]
Cold-rolled	4.10[1,5,7,9,15] 5.10[53]		4.10[1,5,8]	4.10[4], 15		4.10[7]	4.10[4,6]		4.10[3]			4.10[3]	4.80[33]	4.30[12]
Galvanized (10 gage)	4.40[1,9,15]		4.40[1,9]		4.40[4]		4.75[44] 5.50[54]					4.40[3]		
Enameling (12 gage)	4.40[1]		4.40[1,9]	4.40[4]		4.40[7]	4.40[6] 4.90[76] 5.55[54]						5.10[33]	4.70[12]
Long ternes (10 gage)	4.80[9,15]		4.80[1]			4.80[7]	5.30[54]							
Hi Str. low alloy, h.r.	5.05[1,5] 5.30[9]	5.05[1]	5.05[1,5,8]	5.05[4], 5			5.05[1,4] 5.30[6] 5.40[13]		5.05[3]	5.05[26]		5.05[3]		5.50[12]
Hi str. low alloy, c.r.	6.20[1,5] 6.45[9]		6.20[1,5,8]	6.20[4], 5			6.20[4], 6.45[6]		6.20[3]			6.20[3]		6.65[12]
Hi str. low alloy, galv.	6.75[1]											6.75[3]		
STRIP Hot-rolled	3.25[5,7,9] 3.50[28] 3.75[41,58]	3.25[3,66]	3.25[1,5,8]	3.25[3]			3.25[1,4,6] 3.75[13]		3.25[3]	3.50[26]		3.25[3]		3.45[12] 4.05[47]
Cold-rolled	4.15[5,7,9] 4.85[53,58]	4.30[6] 4.50[66]	4.30[6]	4.15[3,5]		4.15[7]	4.15[4,6,48], 4.85[13,49] 4.75[49]		4.15[3]			4.15[3]		4.35[12] 4.95[47] 5.10[51,53]
Hi str. low alloy, h.r.	5.50[9]		4.95[1,5,8]	4.95[3]			4.95[1,4] 5.20[6] 5.30[13]		4.95[3]	4.95[26]		4.95[3]		5.40[12]
Hi Str. low alloy, c.r.	6.45[9]			6.20[3], 5			6.20[4] 6.45[6] 6.55[13]		6.40[3]			6.40[3]		6.40[12]
TINPLATE† Coke, 1.50-lb base box 1.25 lb. deduct 20¢	$7.50[1,5,9,15]		$7.50[1,6,8]				$7.50[4]					$7.60[3]	$7.75[33]	
Electrolytic 0.25, 0.50, 0.75 lb box	Deduct $1.15, 90¢ and 65¢ respectively from 1.50-lb coke base box price													
BLACKPLATE, 29 gage Hollowware enameling	5.30[1,5,15]		5.30[1,6]				5.30[4]					5.40[3]	5.50[33]	
BARS Carbon steel	3.45[1,5,9]	3.45[1,4,33]	3.45[1,5,8]	3.45[4]	3.45[4]		3.45[1,4,6]		3.45[3,4]		3.45[3]			3.65[12]
Reinforcing‡	3.45[1,5]	3.45[4]	3.45[1,5,8]	3.45[4]			3.45[1,4,6]		3.45[3,4]		3.45[3]	3.45[3]		
Cold-finished	4.15[3,4,5], 17,52,69,71	4.15[3,33], 69,70	4.15[4,73], 74	4.15[3], 61	4.15[4], 33,63		4.15[6,49,57]		4.15[70]					4.35[12] 4.30[64]
Alloy, hot-rolled	3.95[1,17]	3.95[1,4,33]	3.95[1,5,8]		3.95[4]		3.95[1,5,35]	3.95[3]	3.95[3,4]		3.95[3]			4.25[12] 4.10[31]
Alloy, cold-drawn	4.90[2,17], 52,69,71	4.90[2,33], 69,70	4.90[4,73], 74	4.90[3], 61	4.90[4], 42,52		4.90[6,35,57]	4.90[3]	4.90[3], 70					5.05[64]
Hi str. low alloy, h.r.	5.20[1,5]		5.20[1,5,8]	5.20[4]			5.20[1] 5.45[6]	5.20[3]	5.20[3]		5.20[3]			5.85[12]
PLATE Carbon steel	3.50[1,5]	3.50[1]	3.50[1,5,8]	3.50[4]			3.50[1] 3.75[13]		3.50[3]	3.75[26]	3.50[3]	3.50[3]	4.20[33]	3.75[12]
Floor plates	4.55[1]	4.55	4.55[3]	4.55[3]						4.55[26]				
Alloy	4.40[1]	4.40[1]	4.40[1]				4.75[13]			4.55[26]	4.40	4.40[3]		
Hi Str. low alloy	5.35[1,5]	5.35[1]	5.35[1,5]	5.35[4], 5			5.60[6] 5.70[13]			5.35[26]	5.35[3]	5.35[3]		5.85[12]
SHAPES, Structural	3.40[1,5,9]	3.40[1,33]	3.40[1,5,8]					3.45[3]	3.45[3]		3.45[3]			
Hi str. low alloy	5.15[1,5]	5.15[1]	5.15[1,5,8]				5.40[6]	5.20[3]	5.20[3]		5.20[3]			
MANUFACTURERS' WIRE Bright	4.50[2,5] 4.75[18]	4.50[2,4,13,34] 4.80[33]		4.50[2], 77			4.50[6]	Kokomo—4.80[30]			4.50[3]	4.60[3]	Duluth—4.50[2] Pueblo—4.75[14]	
PILING, Steel Sheet	4.20[1,9]	4.20[1]							4.20[3]					

STEEL PRICES

Smaller numbers indicate producing companies. See key at right. Prices are in cents per lb unless otherwise noted. Extras apply.

Kansas City	Houston	Birmingham	WEST COAST Seattle, San Francisco, Los Angeles, Fontana		
			F=$76.00		INGOTS Carbon forging, net ton
	$69.00[83]		F=$77.00		Alloy, net ton
		$83.00[11]	F=$72.00[19]		BILLETS, BLOOMS, SLABS Carbon, rerolling, net ton
	$71.00[83]	$83.00[11]	F=$82.00[19]	Geneva=$83.00[16]	Carbon forging billets, net ton
	$74.00[83]		F=$85.00[19]		Alloy net ton
					PIPE SKELP
	4.25[83]	3.85[11]	SF=4.50[24] LA=4.65[24,83]	Portsmouth=3.85[20] Worcester=4.15[3]	WIRE RODS
		3.35[4,11]	SF, LA=4.05[24] F=4.25[19]	Ashland=3.35[7] Niles=3.50[44], Geneva=3.45[16]	SHEETS Hot-rolled (18 ga. & hvr.)
		4.10[11]	SF=5.05[24] F=5.00[19]		Cold-rolled
		4.40[4,11]	SF, LA=5.15[24]	Ashland=4.40[7] Kokomo=4.50[29]	Galvanized (10 gage)
		4.40[11]			Enameling (12 gage)
					Long ternes (10 gage)
		5.05[11]	F=6.00[19]		Hi str. low alloy, h.r.
			F=7.05[19]		Hi str. low alloy, c.r.
					Hi str. low alloy, galv.
3.85[83]	3.85[83]	3.25[11]	SF, LA=4.00[24,83] F=4.40[19], S=4.25[83]	Ashland=3.25[7] Atlanta=3.80[46] Minnequa=4.30[14]	STRIP Hot-rolled
			F=5.75[19] LA=5.85[27]	New Haven=4.85[3], 5.35[58] Trenton=5.00[48]	Cold-rolled
		4.95[11]	F=5.90[19]		Hi str. low alloy, h.r.
			F=6.95[19]		Hi str. low alloy, c.r.
		7.80[11]	SF=8.25[24]		TINPLATE Cokes, 1.50-lb base box 1.25 lb, deduct 20¢
Deduct $1.15, 90¢ and 65¢ respectively from 1.50-lb coke base box price					Electrolytic 0.25, 0.50, 0.75 lb box
					BLACKPLATE, 29 gage Hollowware enameling
4.05[83]	3.85[83]	3.45[4,11]	SF, LA=4.15[24] LA=4.15[83]	Atlanta=4.00[46]	BARS Carbon steel
4.05[83]	3.85[83]	3.45[4,11]	SF, S=4.20[83] F=4.10[19]	Atlanta=4.00[46] Minnequa=4.25[14]	Reinforcing‡
				Putnam, Newark=4.55[89]	Cold-finished
4.55[83]	4.35[20]		LA=5.00[83] F=4.95[19]		Alloy, hot-rolled
				Newark,[89] Worcester[3]=5.20 Hartford=5.20[4]	Alloy-, cold-drawn
		5.20[11]	F=6.25[19]		Hi str. low alloy, h.r.
	3.90[83]	3.50[4,11]	F=4.10[19] S=4.40[83] Geneva=3.50[16]	Claymont=3.90[39] Coatesville=3.90[21] Harrisburg=4.25[38]	PLATE Carbon steel
				Harrisburg=5.25[38]	Floor plates
			F=5.40[19]	Coatesville=4.80[21]	Alloy
		5.35[11]	F=5.95[19]	Geneva=5.35[16]	Hi str. low alloy
4.00[83]	3.80[83]	3.40[11]	SF=3.95[83] LA=4.00[24,83]	Phoenixville=4.25[56] Gen'a=3.40[16] Minnequa=3.85[14]	SHAPES, Structural
		5.15[11]	F=4.00[19] S=4.05[82]	Fontana=5.75[19] Geneva=5.15[16]	Hi str. low alloy
5.10[83]	4.90[83]	4.50[4,11]	SF, LA=5.45[24,83,14]	Portsmouth=4.50[20] Worcester=4.80[3]	MANUFACTURERS' WIRE Bright

Notes: †Special coated mfg ternes deduct $1.15 from 1.50-lb coke base box price. Can-making quality blackplate, 55 to 128-lb, deduct $1.90 from 1.50-lb coke base box. ‡Straight lengths only from producer to fabricator.

KEY TO STEEL PRODUCERS

With Principal Offices

1 Carnegie-Illinois Steel Corp., Pittsburgh
2 American Steel & Wire Co., Cleveland
3 Bethlehem Steel Co., Bethlehem
4 Republic Steel Corp., Cleveland
5 Jones & Laughlin Steel Corp., Pittsburgh
6 Youngstown Sheet & Tube Co., Youngstown
7 Armco Steel Corp., Middletown, Ohio
8 Inland Steel Co., Chicago
9 Weirton Steel Co., Weirton, W. Va.
10 National Tube Co., Pittsburgh
11 Tennessee Coal, Iron & R. R. Co., Birmingham
12 Great Lakes Steel Corp., Detroit
13 Sharon Steel Corp., Sharon, Pa.
14 Colorado Fuel & Iron Corp., Denver
15 Wheeling Steel Corp., Wheeling, W. Va.
16 Geneva Steel Co., Salt Lake City
17 Crucible Steel Co. of America, New York
18 Pittsburgh Steel Co., Pittsburgh
19 Kaiser Steel Corp., Oakland, Calif.
20 Portsmouth Div., Detroit Steel Corp., Detroit
21 Lukens Steel Co., Coatesville, Pa.
22 Granite City Steel Co., Granite City, Ill.
23 Wisconsin Steel Co., South Chicago, Ill.
24 Columbia Steel Co., San Francisco
25 Copperweld Steel Co., Glassport, Pa.
26 Alan Wood Steel Co., Conshohocken, Pa.
27 Calif. Cold Rolled Steel Corp., Los Angeles
28 Allegheny Ludlum Steel Corp., Pittsburgh
29 Worth Steel Co., Claymont, Del.
30 Continental Steel Corp., Kokomo, Ind.
31 Rotary Electric Steel Co., Detroit
32 Laclede Steel Co., St. Louis
33 Northwestern Steel & Wire Co., Sterling, Ill.
34 Keystone Steel & Wire Co., Peoria, Ill.
35 Central Iron & Steel Co., Harrisburg, Pa.
36 Carpenter Steel Co., Reading, Pa.
37 Eastern Stainless Steel Corp., Baltimore
38 Washington Steel Corp., Washington, Pa.
39 Jessop Steel Co., Washington, Pa.
40 Blair Strip Steel Co., New Castle, Pa.
41 Superior Steel Corp., Carnegie, Pa.
42 Timken Steel & Tube Div., Canton, Ohio*
43 Babcock & Wilcox Tube Co., Beaver Falls, Pa.
44 Reeves Steel & Mfg. Co., Dover, Ohio
45 John A. Roebling's Sons Co., Trenton, N. J.
46 Simonds Saw & Steel Co., Fitchburg, Mass.
47 McLouth Steel Corp., Detroit
48 Cold Metal Products Co., Youngstown
49 Thomas Steel Co., Warren, Ohio
50 Wilson Steel & Wire Co., Chicago
51 Sweet's Steel Co., Williamsport, Pa.
52 Superior Drawn Steel Co., Monaca, Pa.
53 Tremont Nail Co., Wareham, Mass.
54 Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
55 Ingersoll Steel Div., Chicago
56 Phoenix Iron & Steel Co., Phoenixville, Pa.
57 Fitzsimmons Steel Co., Youngstown
58 Stanley Works, New Britain, Conn.
59 Universal-Cyclops Steel Corp., Bridgeville, Pa.
60 American Cladmetals Co., Carnegie, Pa.
61 Cuyahoga Steel & Wire Co., Cleveland
62 Bethlehem Pacific Coast Steel Corp., San Francisco
63 Follansbee Steel Corp., Pittsburgh
64 Niles Rolling Mill Co., Niles, Ohio
65 Atlantic Steel Co., Atlanta
66 Acme Steel Co., Chicago
67 Joslyn Mfg. & Supply Co., Chicago
68 Detroit Steel Corp., Detroit
69 Wyckoff Steel Co., Pittsburgh
70 Bliss & Laughlin, Inc., Harvey, Ill.
71 Columbia Steel & Shafting Co., Pittsburgh
72 Cumberland Steel Co., Cumberland, Md.
73 La Salle Steel Co., Chicago
74 Monarch Steel Co., Inc., Hammond, Ind.
75 Empire Steel Co., Mansfield, Ohio
76 Mahoning Valley Steel Co., Niles, Ohio
77 Oliver Iron & Steel Co., Pittsburgh
78 Pittsburgh Screw & Bolt Co., Pittsburgh
79 Standard Forging Corp., Chicago
80 Driver Harris Co., Harrison, N. J.
81 Detroit Tube & Steel Div., Detroit
82 Reliance Div., Eaton Mfg. Co., Massillon, Ohio
83 Sheffield Steel Corp., Kansas City
84 Plymouth Steel Co., Detroit
85 Wickwire Spencer Steel, Buffalo
86 Angell Nail and Chaplet, Cleveland
87 Mid-States Steel & Wire, Crawfordsville, Ind.

*Add 10 pct to quoted prices

STAINLESS STEELS

Base prices, in cents per pound, f.o.b. producing point

Product	301	302	303	304	316	321	347	410	416	430
Ingots, rerolling	13.75	14.50	16.00	15.50	23.75	19.25	21.00	12.25	14.25	12.50
Slabs, billets, rerolling	18.00	19.25	21.25	20.25	31.25	25.50	27.75	16.50	19.50	16.25
Forg. discs, die blocks, rings	32.00	32.00	34.50	33.50	50.50	38.00	42.50	26.00	26.50	26.50
Billets, forging	25.75	25.75	27.75	27.00	40.50	30.50	34.25	21.00	21.50	21.50
Bars, wire, structurals	30.00	30.00	32.50	31.50	47.50	35.50	40.00	24.50	25.00	25.00
Plates	32.00	32.00	34.00	34.00	50.50	39.50	44.00	26.00	26.50-27.00	29.50
Sheets	39.00	39.00	41.00	41.00	54.50	47.00	51.50	34.50	35.00	37.00
Strip, hot-rolled	25.50	27.00	31.25	29.00	47.25	35.75	40.00	22.50	29.25	23.00
Strip, cold-rolled	32.00	34.50	38.00	38.50	56.50	46.00	50.00	28.50	35.00	29.00

STAINLESS STEEL PRODUCING POINTS—*Sheets:* Midland, Pa., 17; Brackenridge, Pa., 28; Butler, Pa., 7; McKeesport, Pa., 1; Washington, Pa., 38 (type 316 add 5¢), 39; Baltimore, 37; Middletown, Ohio, 7; Massillon, Ohio, 4; Gary, 1; Bridgeville, Pa., 59; New Castle, Ind., 55; Ft. Wayne, Ind., 67; Lockport, N. Y., 46.

Strip: Midland, Pa., 17; Cleveland, 2; Carnegie, Pa., 41; McKeesport, Pa., 54; Reading, Pa., 36; Washington, Pa., 38 (type 316 add 5¢); W. Leechburg, Pa., 28; Bridgeville, Pa., 59; Detroit, 47; Massillon, Canton, Ohio, 4; Middletown, Ohio, 7; Harrison, N. J., 80; Youngstown, 48; Lockport, N. Y., 46; New Britain, Conn., 58; Sharon, Pa., 13; Butler, Pa., 7.

Bars: Baltimore, 7; Duquesne, Pa., 1; Munhall, Pa., 1; Reading, Pa., 36; Titusville, Pa., 59; Washington, Pa., 39; McKeesport, Pa., 1, 54; Bridgeville, Pa., 59; Dunkirk, N. Y., 28; Massillon, Ohio, 4; Chicago, 1; Syracuse, N. Y., 17; Watervliet, N. Y., 28; Waukegan, Ill., 2; Lockport, N. Y., 46; Canton, Ohio, 42; *Ft. Worth, Ind., 67.

Wire: Waukegan, Ill., 2; Massillon, Ohio, 4; McKeesport, Pa., 54; Bridgeport, Conn., 44; Ft. Wayne, Ind., 67; Trenton, N. J., 45; Harrison, N. J., 80; Baltimore, 7; Dunkirk, 28.

Structurals: Baltimore, 7; Massillon, Ohio, 4; Chicago, 1, 67; Watervliet, N. Y., 28; Bridgeport, Conn., 44.

Plates: Brackenridge, Pa., 28; Butler, Pa., 7; Chicago, 1; Munhall, Pa., 1; Midland, Pa., 17; New Castle, Ind., 55; Lockport, N. Y., 46; Middletown, 7; Washington, Pa., 39; Cleveland, Massillon, 4.

Forged discs, die blocks, rings: Pittsburgh, 1, 17; Syracuse, 17; Ferndale, Mich., 28.

Forging billets: Midland, Pa., 17; Baltimore, 7; Washington, Pa., 39; McKeesport, 54; Massillon, Canton, Ohio, 4; Watervliet, 28; Pittsburgh, Chicago, 1.

* Add 10 pct to quoted prices.

MERCHANT WIRE PRODUCTS

F.o.b. Mill	Standard & Coated Nails Base Col.	Woven Wire Fence 9-15½ ga. Base Col.	Fence Posts Base Col.	Single Loop Bale Ties Base Col.	Twisted Barbless Wire Base Col.	Gal. Barbed Wire Base Col.	Merch. Wire Am'ld. ¢/lb.	Merch. Wire Gal. ¢/lb.
Alabama City-4	106	116	....	113	126	126	5.35	5.60
Aliquippa, Pa.-5	106	120	....	....	126	130	5.35	5.60
Atlanta-65	113	123	....	119	126	133	5.70	5.95
Bartonville-34	106	116	....	113	126	126	5.35	5.60
Buffalo-85	....	....	....	....	....	....	4.50	....
Chicago-4	106	116	....	113	126	126	....	....
Cleveland-86	111	....	....	....	....	....	....	....
Cleveland-2	....	....	....	....	....	....	5.35	5.60
Crawfordsville-87	112	123	....	120	....	135	5.45	5.95
Donora, Pa.-2	106	120	....	113	126	130	5.35	5.60
Duluth-2	106	120	116	113	126	130	5.35	5.60
Fairfield, Ala.-11	106	120	....	113	126	130	5.35	5.60
Houston-83	114	124	....	....	126	134	5.75	6.00
Johnstown, Pa.-3	106	120	125	....	126	130	5.35	5.60
Joliet, Ill.-2	106	114	116	113	126	130	5.35	5.60
Kokomo, Ind.-30	112	123	....	120	126	135	5.70	5.95
Los Angeles-82	....	....	....	....	....	....	6.30	....
Kansas City-83	118	128	....	125	126	138	5.95	6.20
Minnequa-14	111	123	121	118	126	136	5.60	6.10
Monessen-18	112	123	....	....	126	133	5.60	5.85
Moline, Ill.-4	....	....	112	....	....	....	....	....
Palmer-85	....	....	....	....	....	....	4.80	....
Pittsburg, Cal.-24	125	143	....	137	146	150	6.30	6.45
Portsmouth-20	106	116	....	113	126	126	5.35	5.60
Rankin, Pa.-2	106	120	....	....	126	130	5.35	5.60
San Francisco-14	....	....	....	....	....	....	....	....
So. Chicago, Ill.-4	106	116	116	113	....	126	5.35	5.60
So. San Francisco-14	....	....	....	137	....	151	6.30	6.80
Sparrows Pt.-3	108	....	....	115	126	132	5.45	5.90
Sterling, Ill.-33	112	118	....	119	126	133	5.65	5.85
Struthers, Ohio-6	....	....	....	....	....	....	5.35	5.60
Torrance, Cal.-24	126	....	....	....	....	....	6.30	....
Worcester-2	112	....	....	....	....	....	5.85	6.10
Williamsport, Pa.-51	....	....	130	....	....	....	....	....

Cut Nails, carloads, base $6.75 per 100 lb, (less 20¢ to jobbers) at Conshohocken, Pa., (26), Wareham, Mass., (53) Wheeling, W. Va., (15).

BOILER TUBES

Seamless steel, electric welded commercial boiler tubes, locomotive tubes, minimum wall, per 100 ft at mill, c.l. lots, cut lengths 10 to 24 ft.

OD in in.	gage BWG	Seamless H.R.	Seamless C.R.	Electric H.R.	Weld C.D.
2	13	$20.61	$24.24	$19.99	23.51
2½	12	27.71	32.58	26.83	31.60
3	12	30.82	36.27	29.90	35.18
3½	11	38.52	45.35	37.36	43.99
4	10	47.82	56.25	46.39	54.56

Pittsburgh Steel add, H-R: 2 in., 62¢; 2½ in., 84¢; 3 in., 92¢; 3½ in., $1.17; 4 in., $1.45. Add, C-R: 2 in., 74¢; 2½ in., 99¢; 3 in., $1.10; 3½ in., $1.37; 4 in., $1.70.

RAILS, TRACK SUPPLIES

F.o.b. Mill Cents Per Lb.	No. 1 Std. Rails	Light Rails	Joint Bars	Track Spikes	Axles	Screw Spikes	Tie Plates	Track Bolts Untreated
Bessemer-1	3.40	3.75	4.40	....	....	....	....	....
Chicago-4	....	....	....	5.60	....	....	....	....
Ensley-11	3.40	3.75	....	....	....	....	....	....
Fairfield-11	....	3.75	4.40	....	....	8.60	4.20	....
Gary-1	3.40	3.75	....	....	....	....	4.20	....
Ind. Harbor-8	3.40	....	4.40	5.60	5.25	8.60	4.20	....
Johnstown-3	....	3.75	....	....	5.25	8.60	....	....
Joliet-1	....	3.75	4.40	....	....	....	....	....
Kansas City-83	....	....	....	5.85	....	....	....	....
Lackawanna-3	3.40	3.75	4.40	....	....	8.60	4.20	....
Lebanon-3	....	....	....	5.60	....	....	....	8.85
Minnequa-14	3.40	3.75	4.40	5.60	....	8.60	4.20	8.85
Pittsburgh-77	....	....	....	....	....	....	....	8.85
Pittsburgh-78	....	....	....	....	....	....	....	8.85
Pittsburgh-5	....	....	....	5.60	....	....	....	....
Pittsburgh-24	....	....	....	....	....	....	4.35	....
Seattle-62	....	....	....	6.10	....	....	4.35	....
Steelton-3	3.40	....	4.40	....	....	....	4.20	....
Struthers-6	....	....	....	5.60	....	....	....	....
Torrance-24	....	....	....	....	....	....	4.35	....
Youngstown-4	....	....	....	5.60	....	....	....	....
Weirton-9	....	....	....	....	....	....	4.20	....

Track Bolts, heat treated, to railroads, 9.10¢ per lb.

Numbers after producing points correspond to steel producers. See key on Steel Price page.

PIPE AND TUBING

Base discounts, f.o.b. mills
Base price about $200.00 per net ton

Standard, T & C

	Black	Galv
Steel, Buttweld*		
⅛-in.	40½ to 38½	21 to 18½
¼-in.	43½ to 41½	25 to 21½
1-in.	46 to 44	28 to 22
1¼-in.	46½ to 44½	28½ to 23
1½-in.	47 to 45	29 to 23½
2-in.	47½ to 45½	29½ to 24
2½ to 3-in.	48 to 46	30 to 27
Steel, Lapweld		
2-in.	38	16½
2½ to 3-in.	42	21
3½ to 6-in.	43 to 40	22 to 21½
Steel, seamless		
2-in.	36	17½ to 14½
2½ to 3-in.	39	20½ to 18
3½ to 6-in.	41	22½ to 20
Wrought iron, buttweld		
⅛-in.	+26½	+58½
¼-in.	+16½	+47½
1 & 1¼-in.	+10½	+38½
1½-in.	+ 4½	+35
2-in.	+ 4	+34½
Wrought iron, lapweld		
2-in.	+13½	+42½
2½ to 3½-in.	+11	+38
4-in.	+ 6	+32
4½ to 8-in.	+ 8	+33½
9 to 12-in.	+18	+43

Extra Strong, Plain Ends

Steel, buttweld		
⅛-in.	39½ to 37½	21½ to 17½
¼-in.	43½ to 41½	25½ to 21½
1-in.	45½ to 43½	28½ to 23½
1¼-in.	46 to 44	29 to 24½
1½-in.	46½ to 44½	29½ to 25
2-in.	47 to 45	30 to 25½
2½ to 3-in.	47½ to 45½	30½ to 23½
Steel, lapweld		
2-in.	37	15½
2½ to 3-in.	42	21
3½ to 6-in.	44½ to 41½	23½ to 24
Steel, seamless		
2-in.	35	17½ to 14½
2½ to 3-in.	38	21½ to 18
3½ to 6-in.	42½	25 to 20
Wrought iron, buttweld		
⅛-in.	+22	+52½
¼-in.	+15½	+45½
1 to 2-in.	+ 5½	+34½
Wrought iron, lapweld		
2-in.	+10½	+39
2½ to 4-in.	+ 1	+27½
4½ to 6-in.	+ 5	+32
7 & 8-in.	list	+27
9 to 12-in.	+11½	+36

Threads only, butt, lapweld and seamless pipe, 1 pt higher disc. (lower price). Plain ends, butt, lapweld and seamless, 3 in. & under, 3 pts higher disc. Lapweld, seamless 3½ in. & over, 4 pt higher disc. Buttweld & lapweld steel pipe, jobbers disc. 5 pct.

*Fontana, Calif., deduct 11 pts from left col.; galv., deduct 14 to 13 pts. Bethlehem, Youngstown, add average $3.80 per ton on galv. Republic Steel, galv., add $5 per ton for ⅛ to ¾ in.; $4 per ton for 1 to 1¼ in.; $3 per ton for 1½ to 12 in.

ELECTRICAL SHEETS

22 gage, HR cut lengths, f.o.b. mill

	Cents per lb.
Armature	*6.20
Electrical	*6.70
Motor	*7.95
Dynamo	8.75
Transformer 72	9.30
Transformer 65	9.85
Transformer 58	10.55
Transformer 52	11.35

PRODUCING POINTS—Beech Bottom, W. Va., 15; Brackenridge, Pa., 28; Follansbee, W. Va., 63; Granite City, Ill., 22*, add 70¢; Indiana Harbor, Ind., 4; Mansfield, Ohio, 75; Niles, Ohio, 64, add 30¢; Vandergrift, Pa., 1; Warren, Ohio, 4; Zanesville, Ohio, 7.

WAREHOUSE PRICES

Base prices, f.o.b. warehouse, dollars per 100 lb. (Metropolitan area delivery, add 20¢ to base price except Birmingham, San Francisco, Cincinnati, New Orleans, St. Paul (*), add 15¢; Philadelphia, add 25¢; Chicago, add 30¢).

CITIES	SHEETS			STRIP		PLATES	SHAPES	BARS		ALLOY BARS			
	Hot-Rolled	Cold-Rolled (15 gage)	Galvanized (10 gage)	Hot-Rolled	Cold-Rolled		Standard Structural	Hot-Rolled	Cold-Finished	Hot-Rolled, A 4615 As-rolled	Hot-Rolled, A 4140 Ann.	Cold-Drawn, A 4615 As-rolled	Cold-Drawn, A 4140 Ann
Baltimore	5.15	6.39[1]	6.55[2] 6.65	5.30–5.50[11]	....	5.40–6.04[11]	5.60	5.50	6.10	9.60	9.90	11.12	11.40
Birmingham*	5.15[10]	5.90	6.15[7]	5.10	....	5.55	5.25	5.10	5.80	....	....	....	....
Boston	5.75	6.55[20]	6.94[9] 7.14	5.70	6.90–6.95	6.00	5.75	5.60	6.10–6.60	9.70–9.97	9.80–10.00	11.15	11.45
Buffalo	5.15	5.95	6.94	5.41	7.27	5.65	5.35	5.15	5.75	9.60	9.90	11.05	11.35
Chicago*	5.15	6.20	6.95	5.10	6.30	5.40	5.25	5.10	5.65	9.25	9.55	10.70	11.00
Cincinnati*	5.42–5.97	5.99–6.24	6.39	5.35	....	5.79	5.64	5.35–5.54	5.96–6.25	9.60–9.81	9.90–10.11	11.05–11.26	11.35–11.56
Cleveland	5.15	5.95	7.00–7.10	5.24	6.35	5.52	5.37	5.12	5.75	9.36	9.66	10.81	11.11
Detroit	5.33	6.08–6.33	7.09	5.49	6.43–6.80	5.59–5.79	5.64–5.68	5.39	5.91	9.56	9.86	11.01	11.31
Houston	6.00	....	....	6.10	....	6.00	5.95	6.10	7.80	10.36–10.46	10.50–10.60	11.50	11.96–12.16
Indianapolis	....	....	....	....	7.38	....	....	....	6.15	....	....	....	....
Kansas City	5.75	6.55[20]	7.55	5.70	6.85	6.00	5.85	5.70	6.35	9.85	10.15	11.30	11.60
Los Angeles	5.90	7.45	7.70[2]	5.95	6.70[16]	6.00	5.90	5.90	7.55	10.75	10.75	12.45	12.75
Memphis	5.93	6.68	....	5.98	6.80–6.51	6.08	5.93	5.68	6.51	....	....	....	....
Milwaukee	5.29	6.09	6.94–6.99	5.24	6.32	5.54	5.39	5.24	5.89	9.39	9.69	10.84	11.14
New Orleans*	5.80[1]	6.75 6.85[1]	....	5.55[1]	6.80 6.90[1]	5.65	5.55[1]	5.55[1]	6.75 5.80	....	....	....	....
New York	5.52	6.64	7.54[3]	5.64	6.78	5.68	5.65	5.67	6.44	9.60	9.90	11.08	11.38
Norfolk	6.10[13]	7.00	....	6.30[13]	....	6.15[13]	6.20[13]	6.15[13]	7.20[13]	....	....	....	....
Philadelphia*	6.05	6.20–6.35	6.85[3] 7.25	5.65	6.29	5.65	5.45	5.60	6.21	9.35	9.65	10.80	11.10
Pittsburgh	5.15	5.95	6.60	5.20	5.95–6.00	5.35	5.25	5.10	5.75	9.25	9.55	10.70	11.00
Portland	6.60–7.10[1]	6.40[3]	....	6.65[3]	....	6.40[3]	6.50	6.45–6.45[3]	6.80[14]	12.80[18]	11.60[18]	....	....
Salt Lake City	6.85	6.70	....	7.45	6.75	6.10[3]	5.90	7.35[3]	6.75	....	....	....	....
San Francisco*	6.20	7.00[3]	7.75[3]	6.15	7.85[16]	6.10	6.00	6.00	7.55	10.75	10.75	12.45	12.75
Seattle	6.60[4]	6.15[3]	6.40[3]	6.85[4]	....	6.35[4]	6.20[4]	6.35[4]	6.50[14]	....	11.60[18]	....	13.60[19]
St. Louis	5.48	6.28	7.18	5.43	7.30	5.73	5.58	5.43	6.08	9.58	9.88	11.03	11.33
St. Paul*	5.71	6.51	7.41	5.66	6.18–6.82	5.96	6.81	5.66	6.31	9.81	10.11	11.26	11.56

BASE QUANTITIES *(Standard unless otherwise keyed on prices.)* Hot-rolled sheets and strip, hot rolled bars and bar shapes, structural shapes, plate, galvanized sheets and cold-rolled sheets; 2000 to 9999 lb. Cold-finished bars; 2000 lb or over. Alloy bars; 1000 to 1999 lb.

All HR products may be combined to determine quantity bracket. All galvanized sheets may be combined to determine quantity bracket. CR sheets may not be combined with each other or with galv. sheets to determine quantity bracket.

Exceptions:
(1) 400 to 1499 lb; (2) 450 to 1499 lb; (3) 300 to 4999 lb; (4) 300 to 9999 lb; (5) 2000 to 5999 lb; (6) 1000 lb and over; (7) 500 to 1499 lb; (8) 400 lb and over; (9) 400 to 9999 lb; (10) 500 to 9999 lb; (11) 400 to 3999 lb; (12) 450 to 3749 lb; (13) 400 to 1999 lb; (14) 1500 lb and over; (15) 1000 to 9999 lb; (16) 6000 lb and over; (17) up to 1999 lb; (18) 1000 to 4999 lb; (19) 1500 to 3499 lb; (20) CR sheets may be combined for quantity; (21) 3 to 24 bundles.

PIG IRON PRICES

Dollars per gross ton. Delivered prices do not include 3 pct tax on freight.

PRODUCING POINT PRICES

Producing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	51.00	51.50	52.00	52.50	.....
Birmingham	45.38	45.88	....	....	.....
Buffalo	49.00	49.50	50.00	.....	.....
Chicago	49.00	49.50	49.50	50.00	.....
Cleveland	49.00	49.50	49.50	50.00	54.00
Daingerfield, Tex.	45.00	45.50	45.50	.....	.....
Duluth	49.00	49.50	49.50	50.00	.....
Erie	49.00	49.50	49.50	50.00	.....
Everett	.....	52.25	52.75	.....	.....
Fontana	55.00	55.50	.....	.....	.....
Granite City	50.90	51.40	51.90	.....	.....
Ironton, Utah	49.00	49.50	.....	.....	.....
Pittsburgh	49.00*	.....	.....	50.00	.....
Neville Island	49.00	49.50	49.50	50.00	.....
Geneva, Utah	49.00	49.50	.....	.....	.....
Sharpsville	49.00	49.50	49.50	50.00	.....
Steelton	51.00	51.50	52.00	52.50	57.00
Swedeland	53.00	53.50	54.00	54.50	.....
Toledo	49.00	49.50	49.50	50.00	.....
Troy, N. Y.	51.00	51.50	52.00	.....	57.00
Youngstown	49.00	49.50	49.50	50.00	.....

DELIVERED PRICES (BASE GRADES)

Consuming Point	Producing Point	Rail Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$.60-.90	.....	52.85–53.05	53.35–53.75	.....	.....
Boston	Steelton	6.90	.....	.....	.....	.....	60.90
Brooklyn	Bethlehem	4.29	.....	52.79	53.29	53.79	.....
Cincinnati	Birmingham	6.70	52.08	52.58	.....	.....	.....
Jersey City	Bethlehem	2.63	.....	51.13	51.63	52.13	.....
Los Angeles	Geneva-Ironton	7.70	56.70	57.20	.....	.....	.....
Los Angeles	Fontana	....	56.70	57.20	.....	.....	.....
Mansfield	Toledo-Cleveland	3.33	49.33	49.83	49.83	50.33	54.33
Philadelphia	Bethlehem	2.39	53.39	53.89	54.39	54.89	.....
Philadelphia	Swedeland	1.44	54.44	54.94	55.44	55.94	.....
Philadelphia	Steelton	3.09	54.09	54.59	55.09	55.59	60.09
Rochester	Buffalo	2.63	51.63	52.13	52.63	.....	.....
San Francisco	Geneva-Ironton	7.70	56.70	57.20	.....	.....	.....
San Francisco	Fontana	....	56.70	57.20	.....	.....	.....
Seattle	Geneva-Ironton	7.70	56.70	57.20	.....	.....	.....
Seattle	Fontana	....	56.70	57.20	.....	.....	.....
St. Louis	Granite City	0.75 Arb.	48.65	49.15	49.65	.....	.....
Syracuse	Buffalo	3.58	52.58	53.08	53.58	.....	.....

* *Monessen, $51.00.*

Producing point prices are subject to switching charges; silicon differential (not to exceed 50c per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct for foundry iron); phosphorus differentials, a reduction of 38c per ton for phosphorus content of 0.70 pct and over; manganese differentials, a charge not to exceed 50c per ton for each 0.50 pct manganese content in excess of 1.00 pct, $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron (blast furnace) silicon 6.01 to 6.50 pct C/L per g.t., f.o.b. Jackson, Ohio—$59.50; f.o.b. Buffalo, $60.75. Add $1.50 per ton for each additional 0.50 pct Si up to 17 pct. Add 50c per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for 0.75 pct or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

Charcoal pig iron base price for low phosphorus $62.00 per gross ton, f.o.b. Lyle, Tenn. Delivered Chicago, $70.56. High phosphorus charcoal pig iron is not being produced.

BOLTS, NUTS, RIVETS, SCREWS

Consumer Prices

(Base discount, f.o.b. mill, Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts

	Pct Off List Less Case	C.
½ in. & smaller x 6 in. & shorter	23	35
9/16 in. & ⅝ in. x 6 in. & shorter	26	37
¾ in. & larger x 6 in. & shorter	26	37
All diam. longer than 6 in.	22	34
Lag, all diam. x 6 in. & shorter	30	41
Lag, all diam. longer than 6 in.	28	39
Plow bolts	40	—

Nuts, Hot Pressed, Cold Punched—Sq

	Pct Off List Less Keg K. (Reg)		Less Keg K. (Hvy)	
½ in. & smaller	23	35	23	35
9/16 in. & ⅝ in.	20	32	15	28
¾ in. to 1½ in. inclusive	23	35	10	24
1⅝ in. & larger	16	29	10	24

Nuts, Hot Pressed—Hexagon

½ in. & smaller	33	43	29	40
9/16 in. & ⅝ in.	24	36	15	28
¾ in. to 1½ in. inclusive	20	32	11	25
1⅝ in. & larger	17	30	11	25

Nuts, Cold Punched—Hexagon

½ in. & smaller	33	43	29	40
9/16 in. & ⅝ in.	30	41	25	37
¾ in. to 1½ in. inclusive	27	38	20	32
1⅝ in. & larger	20	32	15	28

Nuts, Semi-Finished—Hexagon

	Reg		Hvy	
½ in. & smaller	41	50	35	45
9/16 in. & ⅝ in.	36	46	29	40
¾ in. to 1½ in. inclusive	31	42	23	35
1⅝ in. & larger	21	33	17	30
	Light			
7/16 in. & smaller	41	50		
½ in. thru ⅝ in.	35	45		
¾ in. to 1½ in. inclusive	33	43		

Broken case or keg add 15 pct.

Stove Bolts

	Pct Off List
Packaged, steel, plain finished	56—10
Packaged, plated finish	41—10
Bulk, plain finish**	67*

*Discounts apply to bulk shipments in not less than 15,000 pieces of a size and kind where length is 3-in. and shorter; 5000 pieces for lengths longer than 3-in. For lesser quantities, packaged price applies.

**Zinc, Parkerized, cadmium or nickel plated finishes add 6¢ per lb net. For black oil finish, add 2¢ per lb net.

Rivets

	Base per 100 lb
½ in. & larger	$7.25
	Pct Off List
7/16 in. & smaller	43

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham, Lebanon, Pa.

Cap and Set Screws

(In bulk)	Pct Off List
Hexagon head cap screws, coarse or fine thread, ¼ in. thru ⅝ in. x 6 in., SAE 1020, bright	58
¾ in. thru 1 in. up to & including 6 in.	53
¼ in. thru ⅝ in. x 6 in. & shorter high C double heat treat	51
⅝ in. thru 1 in. up to & including 6 in.	46
Milled studs	22
Flat head cap screws, listed sizes	24
Fillister head cap, listed sizes	43
Set screws, sq head, cup point, 1 in. diam. and smaller x 6 in. & shorter	57

LAKE SUPERIOR ORES

(51.50% *Fe; natural content, delivered lower lake ports*)

	Per gross ton
Old range, bessemer	$8.10
Old range, nonbessemer	7.95
Mesabi, bessemer	7.85
Mesabi, nonbessemer	7.70
High phosphorus	7.70

After Jan. 25, 1950, increases or decreases in Upper Lake rail freight, dock handling charges and taxes are for buyers' account.

ELECTRODES

Cents per lb, f.o.b. plant, threaded electrodes with nipples, unboxed

Diam. in in.	Length in in.	Cents Per lb
	GRAPHITE	
17, 18, 20	60, 72	17.00¢
8 to 16	48, 60, 72	17.00¢
7	48, 60	18.64¢
6	48, 60	19.95¢
4, 5	40	20.48¢
3	40	21.53¢
2½	24, 30	22.05¢
2	24, 30	24.15¢
	CARBON	
40	100, 110	7.65¢
35	65, 110	7.65¢
30	65, 84, 110	7.65¢
24	72 to 104	7.65¢
20	84, 90	7.65¢
17	60, 72	7.65¢
14	60, 72	8.16¢
10, 12	60	8.42¢
8	60	8.67¢

CLAD STEEL

Base prices, cents per pound, f.o.b. mill

Stainless-carbon	Plate	Sheet
No. 304, 20 pct, Coatesville, Pa. (21)	*28.00	
Washgtn, Pa. (39)	*28.00	
Claymont, Del. (29)	*28.00	
Conshohocken, Pa. (26)		*24.00
New Castle, Ind. (55)	*26.50	*25.50
Nickel-carbon 10 pct, Coatesville (21)	31.00	
Inconel-carbon 10 pct, Coatesville (21)	39.00	
Monel-carbon 10 pct, Coatesville (21)	32.00	
No. 302 Stainless-copper-stainless, Carnegie, Pa. (60)		77.00
Aluminized steel sheets, hot dip, Butler, Pa. (7)		7.75

*Includes annealing and pickling, or sandblasting.

TOOL STEEL

F.o.b. mill

W	Cr	V	Mo	Co	Base per lb
18	4	1	—	—	$1.00
18	4	1	—	5	$1.565
18	4	2	—	—	$1.13
1.5	4	1.5	8	—	71.5¢
6	4	2	6	—	76.5¢

High-carbon-chromium	57.5¢
Oil hardened manganese	32¢
Special carbon	29.5¢
Extra carbon	24.5¢
Regular carbon	21¢

Warehouse prices on and east of Mississippi are 3¢ per lb higher. West of Mississippi, 5¢ higher.

C-R SPRING STEEL

Base per pound f.o.b. mill

0.26 to 0.40 carbon	4.50¢
0.41 to 0.60 carbon	5.95¢
0.61 to 0.80 carbon	6.55¢
0.81 to 1.05 carbon	8.50¢
1.06 to 1.35 carbon	10.80¢

Worcester, add 0.30¢; Sharon, New Britain, Carnegie, New Castle, add 0.35¢; Detroit, 0.26 to 0.40 carb., add 60¢; other grades add 20¢. New Haven, 0.26 to 0.40 carb., add 85¢; other grades add 30¢.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven) Connellsville, Pa.	$14.00 to $14.50
Foundry, beehive (f.o.b. oven) Connellsville, Pa.	$16.50 to $17.00
Foundry, oven coke	
Buffalo, del'd	$25.35
Chicago, f.o.b.	21.00
Detroit, f.o.b.	23.00
New England, del'd	24.30
Seaboard, N. J., f.o.b.	22.00
Philadelphia, f.o.b.	22.10
Swedeland, Pa., f.o.b.	22.00
Plainesville, Ohio, f.o.b.	23.25
Erie, del'd	$22.29 to 22.50
Cleveland, del'd	22.62
Cincinnati, del'd	22.71
St. Paul, f.o.b.	21.00
St. Louis, f.o.b.	24.90
Birmingham, del'd	20.79

FLUORSPAR

Washed gravel fluorspar, f.o.b. cars, Rosiclare, Ill. Base price, per ton net: Effective CaF, content:

70% or more	$41.00
60% or less	38.00

REFRACTORIES

Fire Clay Brick *(F.o.b. works) Carloads, Per 1000*

First quality, Ill., Ky., Md., Mo., Ohio, Pa. (except Salina, Pa., add $5)	$94.00
No. 1 Ohio	88.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	8.00
No. 2 Ohio	79.20
Ground fire clay, net ton, bulk (except Salina, Pa., add $1.50)	13.75

Silica Brick

Mt. Union, Pa., Ensley, Ala.	$94.60
Childs, Pa.	99.00
Hays, Pa.	100.10
Chicago District	104.50
Western Utah and Calif.	111.10
Super Duty, Hays, Pa., Athens, Tex., Chicago	111.10
Silica cement, net ton, bulk, Eastern (except Hays, Pa.)	16.50
Silica cement, net ton, bulk, Hays, Pa.	18.70
Silica cement, net ton, bulk, Ensley, Ala.	17.60
Silica cement, net ton, bulk, Chicago District	17.60
Silica cement, net ton, bulk, Utah and Calif.	24.75

Chrome Brick *Per Net Ton*

Standard chemically bonded, Balt., Chester	$77.00

Magnesite Brick

Standard, Baltimore	$99.00
Chemically bonded, Baltimore	88.00

Grain Magnesite *St. %-in. grains*

Domestic, f.o.b. Baltimore, in bulk fines removed	$62.70
Domestic, f.o.b. Chewelah, Wash., in bulk	36.30
in sacks	41.80

Dead Burned Dolomite

F.o.b. producing points in Pennsylvania, West Virginia and Ohio, per net ton, bulk Midwest, add 10¢; Missouri Valley, add 20¢ $13.00

METAL POWDERS

Per pound, f.o.b. shipping point, in ton lots, for minus 100 mesh.

Swedish sponge iron c.l.f. New York, ocean bags	7.4¢ to 9.0¢
Canadian sponge iron, del'd, in East	10.00¢
Domestic sponge iron, 98+% Fe, carload lots	9.0¢ to 15.0¢
Electrolytic iron, annealed, 99.5+% Fe	36.0¢ to 39.5¢
Electrolytic iron unannealed, minus 325 mesh, 99+% Fe	48.5¢
Hydrogen reduced iron, minus 300 mesh, 98+% Fe	63.0¢ to 80.0¢
Carbonyl iron, size 5 to 10 micron, 98%, 99.8+% Fe	70.0¢ to $1.35
Aluminum	29.00¢
Brass, 10 ton lots	30.00¢ to 33.25¢
Copper, electrolytic	10.25¢ plus metal value
Copper, reduced	10.00¢ plus metal value
Cadmium 100-199 lb.	95¢ plus metal value
Chromium, electrolytic, 99% min., and quantity	$3.50
Lead	6.5¢ plus metal value
Manganese	52.00¢
Molybdenum, 99%	$2.65
Nickel, unannealed	75.5¢
Nickel, annealed	81.5¢
Nickel, spherical, unannealed	78.5¢
Silicon	34.00¢
Solder powder	6.5¢ to 8.5¢ plus met. value
Stainless steel, 302	75.00¢
Tin	11.00¢ plus metal value
Tungsten, 99%	$3.40
Zinc, 10 ton lots	20.50¢ to 23.85¢

CAST IRON WATER PIPE

	Per net ton
6 to 24-in., del'd Chicago	$95.30 to $98.80
6 to 24-in., del'd N. Y.	94.50 to 95.50
6 to 24-in., Birmingham	81.50 to 86.00
6-in. and larger, f.o.b. cars, San Francisco, Los Angeles, for all rail shipment; rail and water shipment less	$108.50 to $112.00

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

(Prices continued on p. 110)

Ferrochrome

Contract prices, cents per pound, contained Cr, lump size, bulk, in carloads, delivered. (65-72% Cr, 2% max. Si.)

0.06% C	30.25	0.20% C	29.25
0.10% C	29.75	0.50% C	29.00
0.15% C	29.50	1.00% C	28.75
2.00% C			28.50
65-69% Cr, 4-9% C			21.75
62-66% Cr, 4-6% C, 6-9% Si.			22.60

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 5¢ for each additional 0.25% N.

S. M. Ferrochrome

Contract price, cents per pound, chromium contained, lump size, delivered.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

Carloads	21.60
Ton lots	23.75
Less ton lots	25.25

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

Carloads	27.75
Ton lots	30.05
Less ton lots	31.85

Chromium Metal

Contract prices, per lb chromium contained packed, delivered, ton lots. 97% min. Cr, 1% max. Fe.

0.20% Max. C.	$1.09
0.50% max. C.	1.05
.00 min. C	1.04

Low Carbon Ferrochrome Silicon

(Cr 34-41%, Si 42-49%, C 0.05% max.) Contract price, carloads, f.o.b. Niagara Falls, freight allowed; lump 4-in. x down, bulk 2-in. x down, 21.75¢ per lb of contained Cr plus 12.00¢ per lb of contained Si.

Bulk 1-in. x down, 21.90¢ per lb contained Cr plus 12.20¢ per lb contained Si.

Calcium-Silicon

Contract price per lb of alloy, dump, delivered.

30-33% Ca, 60-65% Si, 3.00% max. Fe.

Carloads	17.90
Ton lots	21.00
Less ton lots	22.50

Calcium-Manganese—Silicon

Contract prices, cents per lb of alloy, lump, delivered.

16-20% Ca, 14-18% Mn, 53-59% Si.

Carloads	19.25
Ton lots	21.55
Less ton lots	22.55

CMSZ

Contract price, cents per pound of alloy, delivered.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

Alloy 5: 50.56% Cr, 4-6% Mn, 13.50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

Ton lots	19.75
Less ton lots	21.00

V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis. V-5: 38-42% Cr, 17-19% Si, 8-11% Mn.

Ton lots	16.50¢
Less ton lots	17.75¢

Graphidox No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis. Si 43 to 52%, Ti 9 to 11%, Ca 5 to 7%.

Carload packed	18.00¢
Ton lots to carload packed	19.00¢
Less ton lots	20.50¢

SMZ

Contract price, cents per pound of alloy, delivered, 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe, ⅛ in. x 12 mesh.

Ton lots	17.25
Less ton lots	18.50

FERROALLOYS

Ferromanganese

78-82% Mn. maximum contract base price, gross ton, lump size.

F.o.b. Birmingham	$174
F.o.b. Niagara Falls, Alloy, W. Va., Welland, Ont., Ashtabula, O.	$185
F.o.b. Johnstown, Pa.	$187
F.o.b. Sheridan, Pa.	$185
F.o.b. Etna, Clairton, Pa.	$175

$2.00 for each 1% above 82% Mn, penalty, $2.15 for each 1% below 78%.

Briquets—Cents per pound of briquet, delivered, 66% contained Mn.

Carload, bulk	10.45
Ton lots	12.05

Spiegeleisen

Contract prices gross ton, lump, f.o.b.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Palmerton, Pa.	$69.00	$70.00
Pgh. or Chicago	70.00	71.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.

96% min. Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

Carload, packed	29.75
Ton lots	31.25

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	28
Ton lots	30
Less ton lots	32

Medium Carbon Ferromanganese

Mn 80% to 85%, C 1.25 to 1.50. Contract price, carloads, lump, bulk, delivered, per lb. of contained Mn ..... 19.15¢

Low-Carbon Ferromanganese

Contract price, cents per pound Mn contained, lump size, del'd., Mn. 85-90%.

	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	26.25	28.10	29.30
0.07% max. C	25.75	27.60	28.80
0.15% max. C	25.25	27.10	28.30
0.30% max. C	24.75	26.60	27.80
0.50% max. C	24.25	26.10	27.30
0.75% max. C, 7.00% max. Si	21.25	23.10	24.30

Silicomanganese

Contract basis, lump size, cents per pound of metal, delivered, 65-68% Mn, 18-20% Si, 1.5% max. C. For 2% max. C. deduct 0.2¢.

Carload bulk	9.60
Ton lots	11.25
Briquet, contract basis carlots, bulk delivered, per lb of briquet	10.85
Ton lots	11.45

Silvery Iron (electric furnace)

Si 14.01 to 14.50 pct, f.o.b. Keokuk, Iowa, or Wenatchee, Wash., $86.50 gross ton, freight allowed to normal trade area. Si 15.01 to 15.50 pct, f.o.b. Niagara Falls, N. Y., $80.00. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 for each 0.50% Mn over 1%.

Silicon Metal

Contract price, cents per pound contained Si, lump size, delivered, for ton lots packed.

96% Si, 2% Fe	20.70
97% Si, 1% Fe	21.10

Silicon Briquets

Contract price, cents per pound of briquet bulk, delivered, 40% Si, 1 lb Si briquets.

Carload, bulk	6.75
Ton lots	8.35

Electric Ferrosilicon

Contract price, cents per pound contained Si, lump, bulk, carloads, delivered.

25% Si	19.00	75% Si	14.30
50% Si	12.00	85% Si	15.55
90-95% Si			17.50

Calcium Metal

Eastern zone contract prices, cents per pound of metal, delivered.

	Cast	Turnings	Distilled
Ton lots	$2.05	$2.95	$3.75
Less ton lots	2.40	3.30	4.55

Other Ferroalloys

Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Suspension Bridge, N. Y.	
Carload	8.15¢
Ton lots	9.55¢
Calcium molybdate, 45-40%, f.o.b. Langeloth, Pa., per pound contained Mo	$1.05
Ferrocolumbium, 50-60%, 2 in x D, contract basis, delivered, per pound contained Cb.	
Ton lots	$4.90
Less ton lots	4.95
Ferro-Tantalum-columbium, 20% Ta, 40% Cb, 0.30 C. Contract basis, delivered, ton lots, 2 in. x D, per lb of contained Cb plus Ta	$3.75
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Pa., per pound contained Mo	$1.32
Ferrophosphorus, electrolytic, 23-26%, car lots, f.o.b. Siglo, Mt. Pleasant, Tenn., $3 unitage, per gross ton	$65.00
10 tons to less carload	75.00
Ferrotitanium, 40%, regular grade, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti	$1.35
Ferrotitanium, 25%, low carbon, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti	$1.50
Less ton lots	$1.55
Ferrotitanium, 15 to 19%, high carbon, f.o.b. Niagara Falls, N. Y., freight allowed, carload per net ton	$177.00
Ferrotungsten, standard, lump or ¼ x down, packed, per pound contained W, 5 ton lots, delivered	$2.50
Ferrovanadium, 35-55%, contract basis, delivered, per pound, contained V.	
Openhearth	$3.00-$3.05
Crucible	3.10- 3.15
High speed steel (Primos)	3.25
Molybdic oxide, briquets or cans, per lb contained Mo, f.o.b. Langeloth, Pa.	$1.04
bags, f.o.b. Washington, Pa., Langeloth, Pa.	$1.03
Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound	
Carload, bulk, lump	11.00¢
Ton lots, bulk lump	11.50¢
Less ton lots, lump	12.25¢
Vanadium pentoxide, 88-92% V_2O_5 contract basis, per pound contained V_2O_5	$1.28
Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy.	
Ton lots	21.00¢
Zirconium, 12-15%, contract basis, lump, delivered, per lb of alloy.	
Carload, bulk	7.00¢

Boron Agents

Contract prices per lb of alloy, del.

Borosil, f.o.b. Philo, Ohio, freight allowed, B 3-4%, Si 40-45%, per lb contained B	$4.25
Bortam, f.o.b. Niagara Falls	
Ton lots, per pound	45¢
Less ton lots, per pound	50¢
Carbortam, Ti 15-21%, B 1-2%, Si 2-4%, Al 1-2%, C 4.5-7.5% f.o.b. Suspension Bridge, N. Y., freight allowed.	
Ton lots, per pound	10.00¢
Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in. x D. Ton lots	$1.20
F.o.b. Wash., Pa.; 100 lb, up	
10 to 14% B	.75
14 to 19% B	1.20
19% min. B	1.50
Grainal, f.o.b. Bridgeville, Pa., freight allowed, 100 lb and over.	
No. 1	$1.00
No. 6	63¢
No. 79	50¢
Manganese—Boron 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. x D, delivered.	
Ton lots	$1.46
Less ton lots	1.57
Nickel—Boron 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni, delivered.	
Less ton lots	$1.80
Silcaz, contract basis, delivered.	
Ton lots	45.00¢

CONSIDER GOOD USED EQUIPMENT FIRST

AIR COMPRESSOR

1374 cu. ft. Sullivan Class WN-114 Double Acting 14½"x8¾"x7" Air Compressor, Complete with 250 H.P. G.E. Syn. Motor 440/3/60 & Accessories

BENDING ROLL

14' Niles Pyramid Type Plate Bending Roll. Top Roll 18½", Bottom Rolls 14" Diameter. 25 H.P. Westinghouse 440/3/60 Main Drive Motor. 7½ H.P. Westinghouse Elevating Motor

CRANE—OVERHEAD ELECTRIC TRAVELING

100 ton P&H Overhead Electric Traveling Crane. 50 Ft. Span. Two 50 Ton Trolleys. One 5 Ton Auxiliary Hoist. Six Motors 220 volts, 3 phase, 60 cycle

FURNACES—MELTING

500 lb. Moore Size "T" Melting Furnace, With 200 KVA G.E. Transformer 13,200 volt primary, 229 to 85 volt secondary, 3 phase, 60 cycle

3 ton Moore Size "P" Melting Furnace, With 1200 KVA G.E. Transformer 13,440 volt primary to 208 volt secondary, 3 phase, 60 cycle

HAMMER—STEAM DROP

35,000 lb. Chambersburg Steam Drop Hammer. Bore of Cylinder 40" Diameter. Distance Between Vees 54". Built 1941

8000 lb. Chambersburg Steam Drop Hammer. 20 to 1 Steel Anvil (two piece) Safety Cap Cylinder

LATHES—GEARED HEAD

24" x 25' American Heavy Duty Lathe

36" x 27' American Heavy Duty Lathe NEW 1942. Automatic Lubrication, Rapid Traverse, Twin Carriages, Profiling Attachment, 64 Feeds, 12 Spindle Speeds

MANIPULATOR

8000 lb. Alliance Floor Type Forging Manipulator

PRESS—HYDRAULIC FORGING

1000 ton United Steam Hydraulic Forging Press Complete with Accumulator, Intensifier, Tools—NEW 1942

PRESS—TRIMMING

No. 58 Bliss-Consolidated, With Side Trimming Arm. Approx. Stroke 8", Top of Bolster 54" x 32", Motor Driven, Elecl. Equipment Included

SAW—HACK

14" x 14" Peerless Hack Saw, Hydraulic Feed—NEW 1942

TESTING MACHINE

120,000 lb. SOUTHWARK TATE-EMERY Universal Hydraulic Testing Machine—NEW 1946

RITTERBUSH & COMPANY INC.
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New York 8, N. Y.
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The Clearing House

NEWS OF USED, REBUILT AND SURPLUS MACHINERY

New York Market—The used machinery market in New York, like in other industrial centers, is seething. All types of machinery, if new enough, are in strong demand. One dealer reported last week's sales were his best in many months. The only dealers not setting sales records these days in New York are those whose stocks are already too depleted. Replacement of tools sold is becoming more and more of a problem.

Machines in particular demand in New York include screw machines, sheet metal working equipment, and certain types of forging machines. And, probably due to the defense tank building program, the market for horizontal boring mills has strengthened. Though demand for these types of machines is strongest, any late-model machine in reasonably good condition is easily sold these days.

Older Machines Move — The awakening of interest in machines over 10 years old is being reported from all industrial centers. Obviously, as newer machines become scarcer, older machines become more attractive. But some of the increased activity in older machines is due to more active promotion of this market by dealers. It is attractive business because stocks of older machines have not been rapidly depleted. And, as the cost of acquiring late model machines to sell goes steadily up, the profits on older machines already in stock are most welcome.

N. Y. MDNA Meeting—Last week this column reported the November 27 meeting of the New York MDNA chapter, and open house, to be held at the S & S Machinery Co., Brooklyn. The report incorrectly implied that only MDNA members were invited. Actually, S & S and the New York MDNA invites all used machinery dealers to the dinner and open house. MDNA members and non-members, New Yorkers or out-of-towners in for the National Power Show—all are welcome. Those planning to attend the 6 p.m. dinner are asked to notify S & S Machinery Co., 140 53rd St., Brooklyn, in advance.

Electrical Equipment—In contrast to the turbulent market for used machine tools, the market for used and rebuilt electric motors and generators in New York is orderly. Business is good, trade sources report, but in general there are still plenty of used machines available. Prices in the New York area are steady at from 50 to 75 pct of the new machine cost for used electrical equipment of recent vintage.

Copper Shortage—The critical shortage of copper magnet wire plagues rewinders of electric rotating equipment. Many dealers report the situation was never so bad, even during the last war. At least there were priorities then to help get materials for essential work.

The magnet wire shortage is so bad that New York trade sources report they are unable to buy magnet wire from the major producers unless they are able to provide substantial quantities of scrap copper in return.

May Affect Market—The shortage of copper wire is of course affecting production of new motors and generators. This may begin to affect the used equipment market in time. Dealers who have seen what the low production of new machine tools, due mainly to steel shortages, have done to the used machine tool market are wary. They are keeping their stocks high in anticipation of strengthening of demand for used equipment that will come if, as expected, the new equipment market tightens.